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EXPERIMENT STATION RECORD

VOL. 54 JANUARY, 1926 No. 1

In the recent death of Dr. Henry Jackson Waters the cause of agricultural education and research in this country has suffered the loss of an earnest advocate and an able leader. Though his official connection with the land-grant colleges terminated nearly a decade ago, his interest in their welfare had continued unbroken, and his influence for their upbuilding was freely at their disposal.

Dr. Waters belonged to what may be termed the second generation of agricultural college and station workers, but much of his life was spent as a pioneer in this field. He was one of the earliest students in agriculture at the University of Missouri, from which he was graduated in 1886. After two years' service as assistant secretary of the State board of agriculture, he became an assistant in the newly established Missouri Experiment Station. In 1892 he began a three-year service in the Pennsylvania college and station as professor of agriculture and agriculturist, returning to Missouri in 1895 as dean of the College of Agriculture and director of the station.

The 14-year period which followed was for agriculture one of the most critical and noteworthy in the history of the Missouri institution. In 1895 the agricultural faculty consisted of but 5 members, and the entire undergraduate enrollment of the College of Agriculture was but 34. Agricultural education was still but imperfectly understood and little appreciated in the State, and the college was far from popular, once narrowly escaping abolishment by the State legislature. Under Dr. Waters's administration, however, these conditions gradually became greatly ameliorated. The faculty increased in number to 26 and the students to 237. Several new departments were added, and an agricultural library was established. The physical facilities were increased from restricted quarters in the chemistry building to a modern plant with improved equipment. The confidence of the people was secured, and an era of prosperity and enlarged usefulness was inaugurated.

Resigning in 1909 to become president of the Kansas State Agricultural College, Dr. Waters again achieved conspicuous success in administration. In the words of a resolution adopted by the faculty of that institution upon his departure in 1917, "President Waters,

during the nine years of his tenure of office, has shown himself an executive of the highest order, recognizing worth, developing organization, raising standards of scholarship, and bringing the institution and its work into vital relation with the people of the State."

During the period of his presidency, Dr. Waters also served as a commissioner from the United States to the Philippine Islands to report upon the agricultural and educational development of the islands, as State food administrator of Kansas and president of the State Council of National Defense, as president of the State Teachers Association, and as president of the Society for the Promotion of Agricultural Science, and he was prominently connected with other organizations. He was appointed a member of the President's Commission to Fix the Price of Wheat, and in 1919 as a member of the President's Industrial Council, and at various times was strongly advocated for other national posts of high responsibility and honor.

For many years he was a prominent figure in the Association of Land-Grant Colleges, serving on its executive committee and as an active member of the committee on instruction in agriculture. He was greatly interested in teaching methods and problems and was the author of numerous texts in agriculture and related fields.

As managing editor of a large midwestern weekly newspaper since 1917, Dr. Waters continued to wield an influence which was widespread and powerful. His death on October 26, 1925, after a brief illness, abruptly terminated a vigorous and virile career at the comparatively early age of sixty years and with apparently many years ahead for constructive service and leadership.

No reference to Doctor Waters would be complete without specific mention of his services to agricultural research. As agriculturist in the Pennsylvania Station, as director of the Missouri Station, and as president of the Kansas College, he was actively identified with the upbuilding of the experiment stations. As an executive he was consistently concerned with the strengthening of the station personnel by sympathetic cooperation, keen personal interest, and broad vision. He was also directly associated with efforts to solve numerous fundamental problems, notably those of animal nutrition, inaugurating in Missouri the comprehensive studies in this field which have become so widely known and which are still a leading feature of that station's work.

As an instance of Doctor Waters's insistence upon a high standard in the station work, the opening lines of his first director's report in 1896 may profitably be recalled. "It is held," he stated, "that thorough and continuous work along a few of the most important lines of investigation will be productive of far greater good to the agricultural interests of the State than will be superficial and

unscientific work covering many lines." In subsequent reports he reaffirmed this policy, declaring in 1898 that "it has been adhered to in the face of the most urgent but friendly demand from every quarter of the State." Agreement with such a policy would be well-nigh universal to-day, but its formulation and enforcement frequently required courage as well as vision 30 years ago.

Perhaps most useful of all his varied activities, however, were his services as a teacher and inspirer of men. Regarding this phase of his activities, Dean Call of the Kansas College has recently well said that "to confine one's search for Doctor Waters's contribution to agricultural research to the pages of station bulletins, scientific journals, farm papers, and other forms of printed literature is to fail to discover his greatest contribution in this field. His greatest contribution is not to be found on printed pages but in the hearts and minds of men—men whom he had touched and inspired with a greater determination to know the truth."

Both directly and indirectly Doctor Waters greatly influenced the life of his generation, and his memory will not be lightly forgotten. Already on the Missouri campus, Waters Hall, an imposing building in the agricultural group, has just been christened in his honor, but more enduring than even this structure will be his impress upon the wide circle reached by his leadership.

With the beginning of a new volume, a number of changes in the arrangement and classification of abstracts in the *Record* have become effective. Some of these, such as the change in title of the opening section from Agricultural Chemistry—Agrotechny to Agricultural and Biological Chemistry, are, like the substitution some months ago of the more commonly used Agricultural Engineering for Rural Engineering, intended merely to express more accurately the present scope of the sections and involve no innovations as to subject matter. Of greater significance, however, is the group of alterations which are designed to assemble in more convenient and readily accessible form the abstracts pertaining to the rapidly increasing literature dealing with the various branches of home economics.

Organized research in home economics is of course comparatively recent, and until recently it has been found possible to include nearly all of the material of interest to home economics workers in the section entitled Foods—Human Nutrition. This section of the *Record* was organized 25 years ago by a separation from the section Foods—Animal Production, in recognition of the development then well under way of the subject as a distinctive field of inquiry. The quarter century which has followed has been noteworthy for a long line of important contributions, some of which, such as the dis-

coveries as to the vitamins, have been found to be of great significance in the entire field of animal nutrition and in the combating of numerous hitherto obscure diseases.

With the growth of home economics instruction and extension work, however, there has come about an expansion in the research field, so that, in addition to the studies of foods and nutrition, increasing attention has been devoted to other aspects of the home and its interests. Problems of clothing and textiles, household equipment and management, the care of children, and other details of family life have been studied more and more completely as progress in overcoming such limiting factors as the financial resources of institutions and the supply of competent instructors has afforded greater opportunity for this work. Some of these studies when published have been fitted into the *Record* as appropriately as possible under the heading of Rural Economics and Sociology, others in Agricultural Engineering, Field Crops, and Agricultural Education, or occasionally in Agricultural Chemistry—Agrotechny, or even other sections. Necessarily, however, this disposition of the material has scattered it in a way which was very inconvenient for home economics workers, as well as unsatisfactory from other points of view.

The new arrangement retains the section of Foods—Human Nutrition, and this will continue to include the fundamental studies which have historically been associated with human nutrition, even though of broad interest to nutrition workers in general. Immediately following it, however, will be two new sections, one entitled Textiles and Clothing and the other Home Management and Equipment. The first of these sections will embrace studies of the handling and utilization of textile fibers and similar materials hitherto included with production articles in field crops, forestry, or animal production, as well as studies of clothing and laundering, for which no appropriate place has existed. The section on Home Management and Equipment will include many of the farm home studies formerly classified under Rural Sociology and Agricultural Engineering.

The additional sections are obviously considerably broader in scope than the portions which they will replace, and ultimately it is hoped that they may be developed with the growth of their respective subjects. Unfortunately, however, the total space available in the *Record* is now no greater than before. The last enlargement from 1,600 pages to 1,800 pages per annum was made in 1911, since which time both the quantity of agricultural research and its quality have increased tremendously. This condition has inevitably created severe pressure for space for abstracts and is already responsible for considerable congestion. Under these circumstances little expansion

of any subject can be expected, although it is planned to cover at least the station and Department of Agriculture studies in these fields as adequately as possible.

The numerous articles reporting progress in home economics instruction methods and institutions, textbooks, and illustrative material of special interest to teachers will continue to be grouped with the corresponding articles dealing with agricultural education. Recognition will be given, however, to the broader scope of the section by its redesignation as the section of Agricultural and Home Economics Education. As under the new plan of arrangement it will immediately precede the sections of Foods—Human Nutrition, Textiles and Clothing, and Home Management and Equipment, there will thus be brought together, practically at the end of each number, most of the articles of primary interest to home economics workers.

No discussion of the question of classification in an abstract journal would be complete without a word of caution as to the limitations of any scheme of classification. As was pointed out in these columns some years ago, the sections of the *Record* are not and never can be "water-tight compartments." Because of the complex nature of many of the subjects the classification of abstracts is largely a matter of individual judgment on the part of the classifier, and there need be little expectation of infallibility. Moreover, as was pointed out in a recent prospectus of *Biological Abstracts*, "the grouping of abstracts into sections serves a useful purpose chiefly during current reading; the indexes, the only effective avenues of approach when abstracting journals are later used, are prepared without reference to the sections in which the abstracts were printed, and any inconvenience growing out of misallocation of abstracts or unwise delimitation of sections is thus only temporary."

Home economics workers will doubtless continue to find, as do most other groups of specialists, that regular perusal of several sections of the *Record* is quite desirable. Agricultural and Biological Chemistry, Economic Zoology—Entomology, Animal Production, Dairying, Agricultural Engineering, and, perhaps most helpful of all, Rural Economics and Sociology, should still reveal many matters of interest and points of contact, and occasional articles will surely appear in most of the remaining sections. It is hoped, however, that the segregation now attempted will mean for home economics workers an appreciable gain in convenience, in addition to being a well-merited recognition of a subject which, under the stimulus of the Purnell legislation, seems destined to occupy an increasingly important position in the experiment stations and to contribute more and more to the well-being of the homes of the Nation.

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

A treatise on physical chemistry, I, II, edited by H. S. TAYLOR (*New York: D. Van Nostrand Co., 1924, vols. 1, pp. XI+603+41, pls. 3, figs. 149; 2, pp. IX+701-1359+41, figs. 100*).—This treatise on the theoretical aspects of modern physical chemistry is the cooperative effort of 17 physical chemists. "It is hoped that, in this way, a more authoritative treatment of the several branches of the subject may have been achieved; perhaps, also, a fresher exposition of the subject in its various phases may have been realized. Through cooperation, it should have been possible to secure a more up-to-date record of the present status of the science, since the time consumed in the preparation of such a treatise can obviously be reduced beyond the limits which must be demanded by a single author."

Practical chemistry by micro-methods, E. C. GREY (*Cambridge, Eng.: W. Heffer & Sons, 1925, pp. IX+124, pls. 2, figs. 19*).—In this laboratory manual the methods of microchemistry have been adapted to the ordinary laboratory exercises of general inorganic chemistry, including qualitative and volumetric analysis and such work in organic chemistry as is usually given in a course on general chemistry.

Chemistry of colloids and industrial applications, L. MEUNIER (*Chimie des Colloides et Applications Industrielles. Paris: J.-B. Ballière & Sons, 1924, pp. 336, figs. 11*).—This is a part of the Encyclopédie de Chimie Industrielle, edited by Matignon.

The theory and application of colloidal behavior.—I, The theory of colloidal behavior. II, The application of colloidal behavior, edited by R. H. BOGUE (*New York and London: McGraw-Hill Book Co., 1924, vols. 1, pp. XI+444+XX, figs. 66; 2, pp. VII+445-829+XX, figs. 34*).—These two volumes contain the contributions of 34 specialists in various phases of the theory and application of colloidal behavior. Among the many subjects represented, the following have been selected as of particular interest: (Vol. I) Crystalloidal and Colloidal Behavior of Proteins, by J. Loeb; The Colloidal Behavior of the Body Fluids, by D. D. Van Slyke; Enzymes, by E. F. Armstrong; Jellies and Gelatinous Precipitates, by H. B. Weiser; The Study of Soap Solutions and Its Bearing upon Colloid Chemistry, by J. B. McBain; (Vol. II) The Colloid Chemistry of the Soil, by M. Whitney; The Colloid Chemistry of the Cereals, by C. L. Alsberg; Fruit Jellies, by L. W. Tarr; Cellulose and Its Derivatives, by G. J. Esselen, jr.; and Casein and the Dairy Industry, by H. F. Zoller.

Chemical dynamics of life phaenomena, O. MEYERHOF (*Philadelphia and London: J. B. Lippincott Co., 1924, pp. 110, figs. 8*).—This volume, which is one of a series of monographs on experimental biology, consists of five lectures dealing, respectively, with the physicochemical mechanism of cell respiration, autoxidations in the cell, chemical relations between respiration and fermentation, the transformation of energy in muscle, and the energetics of cell processes. An extensive bibliography is included.

Organic syntheses, edited by O. KAMM ET AL. (*New York: John Wiley & Sons; London: Chapman & Hall, 1925, vol. 4, pp. VII+89, figs. 8*).—This volume, which continues the series previously noted (E. S. R., 50, p. 709), contains directions for the preparation of 28 organic compounds. The cumulative index, begun with the last volume, has been continued.

The evolution of our knowledge of the chemical structure of proteins [trans. title], A. BLANCHETIÈRE (*Bul. Soc. Chim. Biol., 7 (1925), No. 3, pp. 218–330*).—This is a historical survey of the literature on the chemistry of the proteins, with 388 literature references.

Fats: Natural and synthetic, W. W. MYDDLETON and T. H. BARRY (*London: Ernest Benn, 1924, pp. XI+182, pls. 8, figs. 26*).—A useful reference book on the methods of preparation, properties, composition, and important uses of the synthetic or hydrogenated fats.

Vegetable fats and oils, L. E. ANDÉS, trans. by H. B. STOCKS (*London: Scott, Greenwood & Son, 1925, 4. ed., rev. and enl., pp. VIII+413, figs. 104*).—A revision of the volume previously noted (E. S. R., 41, p. 110).

Textbook of cellulose chemistry, E. HEUSER, trans. by C. J. WEST and G. J. ESSELEN, JR. (*New York and London: McGraw-Hill Book Co., 1924, pp. XI+212, fig. 1*).—This is a translation of the second German edition of this volume, the first edition of which has been noted previously (E. S. R., 47, p. 502).

Isolation and identification of some of the sugars in copra meal and coconut water, E. M. CABAY (*Philippine Agr., 13 (1924), No. 6, pp. 229–253, pls. 3*).—In this paper, which supplements a previous study on the composition of copra (E. S. R., 46, p. 803), the results are reported of the isolation and identification of raffinose, sucrose, fructose, galactose, and glucose from copra meal, and sucrose, fructose, and glucose from the coconut water of the coconuts from which the copra was prepared. The methods of extracting the sugars, preparing the sirups, and isolating and identifying the individual sugars are described in detail, and microphotographs are included of the various osazones and hydrazones obtained.

The biochemistry of acetone formation from sugars by Bacillus acetoethylicum, H. B. SPEAKMAN (*Jour. Biol. Chem., 64 (1925), No. 1, pp. 41–52, figs. 2*).—A study of the fermentation products of various sugars and glycerol by *B. acetoethylicum* isolated by Northrop, Ashe, and Senior (E. S. R., 41, p. 415), is reported, together with a discussion of previous work on the subject.

Evidence was obtained that pyruvic acid is an intermediate compound in this fermentation, and that acetone, ethyl alcohol, and volatile acids are formed from the pyruvic acid. The probable changes involved are illustrated by structural equations.

The non-volatile acids of the strawberry, the pineapple, the raspberry, and the Concord grape, E. K. NELSON (*Jour. Amer. Chem. Soc., 47 (1925), No. 4, pp. 1177–1179*).—Continuing the investigation of the nonvolatile acids of fruits and berries (E. S. R., 53, p. 803), the author reports the nonvolatile acids of the strawberry to consist of about 90 per cent of citric acid and 10 per cent of *l*-malic acid. In the pineapple the respective proportion of the same acids are about 87 and about 13 per cent, and in the red raspberry 97 and 3 per cent, while the black raspberry contains 100 per cent citric acid. About 60 per cent of the nonvolatile acids of the Concord grape is *l*-malic and about 40 per cent *d*-tartaric acid.

The relation of pectose and pectin in apple tissue, M. H. CARRÉ (*Biochem. Jour., 19 (1925), No. 2, pp. 257–265, fig. 1*).—"It is shown by the author that Tutin's views on the nonexistence of protopectin (pectose) [E. S. R., 50, p.

310] can not be maintained by the evidence afforded by his experiments. On the contrary, chemical investigations, borne out by miscroscopical work, indicate the presence of an insoluble pectic constituent in apple tissue, which is referred to as pectose and which is converted by a process of hydrolysis into the soluble modification known as pectin."

Industrial applications of invertase, H. S. Paine, C. F. Walton, jr., and M. S. Badollet (*Indus. and Engin. Chem., 17 (1925), No. 5, pp. 445–450, figs. 3; also in Planter and Sugar Manfr., 74 (1925), No. 20, pp. 387–390*).—The advantages and disadvantages of the inversion of sucrose in food products are summarized briefly, the requirements of successful inversion on an industrial scale with the enzyme invertase are outlined, and descriptions are given, with illustrative data, of the process as applied to golden sirup and similar products, maple sirup and maple cream, cane sirup, and miscellaneous products.

The resistance of the antirachitic substance in cod liver oil to reagents, C. E. Bills (*Jour. Biol. Chem., 64 (1925), No. 1, pp. 1–9*).—Tests of the chemical properties of the antirachitic vitamin were conducted on unfrozen unadulterated Newfoundland cod liver oil, the criterion for activity being the line test of McCollum et al. (E. S. R., 47, p. 566) in the examination of the bones of rats on diets in which the oil was used as the sole source of antirachitic vitamin.

As thus tested, evidence was obtained that the antirachitic vitamin in cod liver oil is not destroyed by hydrogen dioxide, hydrogen sulfide, sulfur dioxide, or formaldehyde, but is readily destroyed by nitrous fumes and more slowly by direct steam or contact with mineral acids.

Water solubility of various wood tars, H. N. Calderwood, jr. (*Indus. and Engin. Chem., 17 (1925), No. 5, p. 455*).—Data obtained by A. V. Ruiz on the solubility in water of various wood tars, using the method described by the author (E. S. R., 53, p. 718), are reported with brief comments. Expressed as grams of tar per 100 cc. of water, the solubilities of various tars from hard maple were as follows: Raw settled tar 1.05, boiled 0.6, and dissolved 8.6 gm. A sample of raw pine tar had a solubility of 0.225 gm.

Test for comparing detergent efficiencies of soaps, R. M. Chapin (*Indus. and Engin. Chem., 17 (1925), No. 5, pp. 461–465, figs. 2*).—"A test for the relative deflocculating or detergent efficiencies of soaps is based upon the observation that, when dilute soap solutions are shaken with powdered flake graphite in presence of air, the appearance of a white band at the lower boundary of the froth indicates the presence of an excess of soap. The graphite is standardized against an ammonium palmitate solution containing sufficient excess of ammonia to insure maximum detergent power. A table shows the analyses, the detergent coefficients, and the costs per unit of detergency of 11 unidentified samples of commercial cake soaps."

A method of microtitration, P. B. Rehberg (*Biochem. Jour., 19 (1925), No. 2, pp. 270–277, fig. 1*).—The principles involved in titration are discussed briefly, and an apparatus for microtitration is described and illustrated.

The chief feature of the apparatus is a capillary burette operated by an iron screw working in mercury. During the titration the tip of the burette is adjusted to dip in the fluid being titrated, thus avoiding the formation of drops. This apparatus is said to allow the addition of fluid from a burette in accurately measured quantities as small as 0.1 cu. mm.

Determination of iodine in iodides [trans. title], J. Weichherz and Z. Klinger (*Chem. Ztg., 48 (1924), No. 52, pp. 269, 270*).—The method described consists essentially in oxidizing the iodide in acid solution with potassium permanganate, removing the excess permanganate with oxalic acid, and titrat-

ing the liberated iodine with thiosulfate. The addition of formic acid is said to make possible the titration of iodine in the presence of large amounts of chlorides and bromides.

The determination of cyanamide, L. A. Pinck (*Indus. and Engin. Chem., 17 (1925), No. 5, pp. 459, 460*).—The method first studied was a combination of the Caro (E. S. R., 25, p. 24) and Brioux (E. S. R., 24, p. 323) methods consisting of the addition of silver nitrate solution to ammoniacal solution of cyanamide and the determination of the nitrogen in the silver cyanamide by the Kjeldahl-Gunning method. This proving unreliable for samples containing large amounts of cyanamide derivatives, particularly dicyanodiamide, a volumetric method was developed, the technique of which is as follows:

"A 2-gm. sample of crude calcium cyanamide is extracted for 2 hours with 400 cc. of water in a shaking machine. After filtering, 50-cc. aliquots are pipetted into 250-cc. beakers, 1 cc. concentrated ammonia is added, and ammoniacal silver nitrate run in with constant stirring from a burette at such a rate that the drops can be counted very readily. If the sample is in solution, *an aliquot equivalent to about 50 mg. nitrogen is taken for analysis.* After standing for 15 minutes the precipitate is filtered off through a Gooch crucible containing an asbestos mat. The silver cyanamide precipitate is washed 8 to 10 times with distilled water, then dissolved with dilute nitric acid (approximately 1 N), and titrated with standard thiocyanate solution in the presence of ferric alum indicator."

If a large amount of dicyanodiamide is present, the silver cyanamide precipitate should be redissolved in dilute nitric acid. If carbide is present, the precipitate should be treated by the Kjeldahl method instead of by titration.

The determination of small amounts of protein nitrogen, E. R. Main and A. P. Locke (*Jour. Biol. Chem., 64 (1925), No. 1, pp. 75–80, fig. 1*).—For determining protein in amounts producing less than 10^{-4} gm. of nitrogen, the authors recommend the Folin-Denis method (E. S. R., 36, p. 316) modified by measuring the colors of the final Nesslerized solution with a spectrometer, using the Keuffel-Esser color analyzer. This is said to permit the use of samples containing as little as 0.005 mg. of protein nitrogen with fairly accurate results.

Glutathione.—Synthesis, C. P. Stewart and H. E. Tunnicliffe (*Biochem. Jour., 19 (1925), No. 2, pp. 207–217*).—Glutathione has been synthesized by two methods, and the properties of the resulting compound have been compared with those of the naturally occurring gluthathione.

The first method, starting with glutaminic acid and going through the intermediate compounds hydantoinpropionic acid, hydantoinpropionyl bromide, dihydantoinpropionyl cystine, and diuraminoglutaryl cystine, yielded a product differing from the natural substance only in its optical activity. The second method, from glutaminic acid through glutaminyl monobromide to glutathione, yielded a substance completely identical with natural glutathione. Both methods are thought to substantiate the constitution of gluthathione previously advanced (E. S. R., 50, p. 308).

Glutathione.—The occurrence and quantitative estimation of glutathione in tissues, H. E. Tunnicliffe (*Biochem. Jour., 19 (1925), No. 2, pp. 194–198*).—The method adopted for determining quantitatively the glutathione content of various tissues consists in grinding a known weight of the tissue in a mortar with sand and 10 per cent trichloracetic acid, filtering on a small Buchner funnel, and repeating the process twice. The combined extract is titrated with N/100 iodine solution, using sodium nitroprusside as external indicator, and the amount of glutathione calculated on the assumption that 1 cc. of the iodine solution is equivalent to 2.5 mg. of reduced glutathione.

Urea, uric acid, creatinine, glucose, and fructose have been found not to interfere with the reaction, and known amounts of reduced glutathione added to the tissue have been satisfactorily recovered. Estimations of the soluble organic sulfur by determination of sulfate and total sulfur have shown satisfactory agreement with the results obtained by iodine titration, indicating that the —SH groups alone are being estimated.

Using this method, the glutathione content of various tissues has been estimated with the following average results: Skeletal muscle, rat 0.034 and rabbit 0.04 to 0.045 per cent; liver, rat 0.18 and rabbit 0.24 per cent; kidney 0.17 per cent; and fresh yeast 0.18 per cent. No trace of glutathione could be detected in whole blood and in eggs.

The determination of blood sugar, S. R. Benedict (*Jour. Biol. Chem., 64 (1925), No. 1, pp. 207–213*).—A method of determining sugar in blood is described which is essentially a modification of the author's method of determining sugar in urine (E. S. R., 47, p. 315). The principal changes in the method are as follows:

In the copper reagent the concentration of citrate has been increased and that of copper and carbonate decreased, and a small amount of sodium bisulfite has been added. This addition has been found to give a decided increase in the quantity of cuprous oxide obtainable from the small amount of sugar contained in the dilute blood filtrate. The complex tungstic acid color reagent is prepared as in the usual method, except that 5 per cent of commercial formalin is added to prevent a color reaction with the sulfite. The preparation of the reagents and the technique of the method, which is practically the same as that of Folin and Wu, are discussed, and comparative results by the method on 14 samples of blood are reported. The results by the new method average about 20 per cent lower than those by the Folin and Wu method, but added glucose is recovered satisfactorily by the procedure. The new method is thought to be suitable for application in the various modifications of the Folin-Wu procedure.

Modification of Bloor's method for the determination of cholesterol in whole blood or blood serum, G. E. Sackett (*Jour. Biol. Chem., 64 (1925), No. 1, pp. 203–205*).—The principal change from the original method of Bloor (E. S. R., 35, p. 13) is in the use of small amounts of material, and the separation of the precipitate by centrifuging instead of filtering. The technique of the precipitation is as follows:

To a mixture of 9 cc. of alcohol and 3 cc. of ether in a 15-cc. graduated centrifuge tube is added slowly 0.2 cc. of whole blood or plasma. The tube is corked, shaken vigorously, and left in a horizontal position for 30 minutes, after which it is centrifuged rapidly for 3 minutes, decanted into a small beaker, and evaporated to dryness on a water bath. The cholesterol is extracted twice for about 2 minutes with 20 cc. of chloroform, decanted into a 10-cc. glass-stoppered cylinder, cooled, and made up to 5 cc. The rest of the procedure is practically the same as the original method.

The procedure is recommended as having the advantages over the Bloor method of requiring less alcohol and ether, eliminating the brown color which is apt to develop in the unknown, and requiring less time and blood for the determination.

The determination of urea in 0.1 cc. of blood by microtitration, P. B. Rehberg (*Biochem. Jour., 19 (1925), No. 2, pp. 278–280, fig. 1*).—The method described is a modification of the Van Slyke urease method adapted to the use of amounts as small as 0.1 cc. of blood, using for the titration the micro apparatus described on page 9.

Practical milling, B. W. DEDRICK (*Chicago: Natl. Miller, 1924, pp. 576, figs. 404*).—This textbook on flour milling methods, which was prepared for use in the flour milling engineering course at the Pennsylvania State College, deals exhaustively with all phases of the milling industry, with special emphasis on engineering problems. Chapters on flour testing and baking and on the chemistry of wheat and flour are included.

Milling chemistry: Questions and answers, compiled by S. J. LAWELLIN and N. C. EVANS (*Chicago: Natl. Miller, 1925, pp. 128*).—This volume is made up of questions and answers which have appeared in the department of milling chemistry of *National Miller*. These have been grouped under the headings chemistry fundamentals; wheat and its preparation; flour problems; absorption, fermentation, and baking; bread troubles; protein and gluten; ash and moisture; bleaching and maturing; laboratory equipment and methods; and miscellaneous.

Some tests on winter wheat, B. W. DEDRICK (*Millers Rev. and Dixie Miller, 87 (1925), No. 2, pp. 32, 33, 48, figs. 3*).—Data are reported on the chemical analyses and the results of baking tests of 12 varieties of winter wheat grown in 1924 at the Pennsylvania Experiment Station. Samples of the wheat were separated before grinding into hard and soft berries. The average distribution of the two was 53.4 per cent of the hard and 46.6 per cent of the soft. The average results of the analyses were as follows: Wet gluten 33.96, dry gluten 10.24, protein 10.14, ash 0.5, flour 73.1, and absorption 56.3 per cent. The data reported on the baking quality of the flours are as follows: Average weight of loaf 146.9 gm., volume 528 cc., color 99.5, texture 99.95, flavor 101, and crust 100 per cent.

Data are also reported on the baking quality of soft flour to which fermented bran extract and fresh bran extract had been added. The flour to which the fresh bran extract had been added gave a loaf scoring even higher than the loaf from standard hard wheat.

It is suggested that a strong bread flour meeting the bakers' requirements could be made by blending with flour from hard winter wheat a certain amount of the soft wheat flour or preferably by grinding spring or hard winter wheat with soft wheat in proportions depending upon the strength of each flour.

Defecation in cane sugar manufacture, J. D. BOND (*Indus. and Engin. Chem., 17 (1925), No. 5, pp. 492–495; also in Planter and Sugar Manfr., 74 (1925), No. 21, pp. 408–410*).—A study is reported of the chemical changes involved in the defecation of cane sirup under varying conditions. The effect of the organic matter is shown to be secondary to that of inorganic matter. Of the latter, phosphates are the determining factor. The process is considered to be the removal of coarse dispersoids from the juice by the formation of a flocculent precipitate within the juice. The phosphate content of the juice and the reaction, particularly as affecting the relation of CaO to P_2O_5, determines the volume of the settlings and the efficiency of the process. Attempts to devise a laboratory scheme of clarification by treating the mixed juices with barium hydroxide and freshly precipitated silver oxide, followed by a second filtration through Filter-Cel after heating, are reported with excellent results.

Cane syrup and molasses, their composition, production, and consumption in the United States, W. L. OWEN (*Planter and Sugar Manfr., 74 (1925), No. 9, pp. 168–170*).—This paper consists of a brief historical summary of the development of the sugar industry from the earliest times to the present day, data on the average composition of sugar cane sirups from various localities, a brief discussion of present methods of manufacturing sirup and molasses,

with analyses of the latter, and statistics on the production of edible molasses in this country from 1912 to 1923, inclusive.

Fruit juice concentrates, J. H. Irish (*California Sta. Bul. 392 (1925), pp. 3–20, figs. 5*).—This publication supplements Bulletin 359 (E. S. R., 49, p. 412) in that it deals with the preparation of fruit juice concentrates from which the carbonated beverages discussed in the former bulletin can be prepared.

The principal methods which have been devised for fruit juice concentration are outlined, including concentration by heat at atmospheric pressure, in vacuo, by the spray process and the solar process, and concentration by freezing. Special attention is given to methods of concentration by heating in vacuo and by freezing, and a new method devised by the author for concentration by freezing is described. This consists essentially in the adaptation of a method used in the commercial production of ice in which the liquid is agitated during the freezing until a solid cake of ice is formed with a cavity at the bottom where the agitation takes place. The concentrated fruit sirup occupies this cavity and can be siphoned off or drained from the ice.

While concentration by freezing is considered to be the best method as regards the preservation of color and flavor, concentration in vacuo in a glass-lined vacuum pan is recommended as the most practical method in general.

Special directions are given for concentrating grape, apple, and pomegranate juice and the juices of various berries and for the utilization of orange, lemon, grape, apple, strawberry-blackberry, and cherry concentrates in the making of carbonated beverages and of pomegranate and mixed-fruit concentrates in the making of punch, with suggestions for other uses of the concentrates. As means of preserving the concentrates, cold storage, pasteurization, and chemical preservation with sodium benzoate are suggested.

Commercial dehydration of fruits and vegetables, P. F. Nichols, R. Powers, C. R. Gross, and W. A. Noel (*U. S. Dept. Agr. Bul. 1335 (1925), pp. 40, figs. 10*).—This reference work on dehydration includes directions for the selection and preparation of material, detailed descriptions of the construction and operation of the ordinary forced-draft driers of the compartment and tunnel types, and methods for determining the end point of the dehydration and for curing, packing, and storing dehydrated products. Special directions are given for the preparation and dehydration of the principal fruits and vegetables, with data on waste and yields.

A section on insects attacking dried fruits, with preventive and remedial methods, is contributed by E. A. Back.

METEOROLOGY

Solar radiation and the weather (*Bul. Amer. Met. Soc., 6 (1925), No. 7, pp. 94–105*).—This is a summary of a symposium on the subject at the Washington meeting of the American Meteorological Society, May 2, 1925, with abstracts of related papers, including discussions of the relation of solar constants to weather, by C. F. Marvin; Smithsonian solar constant values, by H. H. Kimball; statistical analysis of solar radiation data, by H. W. Clough and C. G. Abbot; and the use of solar variation in forecasting by the Argentine weather service, by H. H. Clayton.

Solar variation and the weather, C. G. Abbot (*Science, 62 (1925), No. 1605, pp. 307, 308*).—In a brief discussion of the accuracy of the Smithsonian Institution's measurements of the sun's rays available to warm the earth, it is stated that "the duplicate daily results since 1920 agree within 0.5 per cent and combine to indicate decided variability of the sun." The reliability of weather forecasts by Clayton and others based on the measurements is also briefly

discussed. "The Smithsonian Institution has compared these forecasts with the events for a period exceeding one year and finds by mathematical methods, altogether without opportunity for personal bias, that a real foreknowledge by Mr. Clayton is exhibited."

A remarkable sixteen-yearly climatic period and other possible periods [trans. title], A. WAGNER (*Sitzber. Akad. Wiss. Wien, Math. Naturw. Kl., 133 (1925), IIa, No. 5–6, pp. 169–224, figs. 12; abs. in Sci. Abs., Sect. A—Phys., 28 (1925), No. 332, pp. 602, 603*).—It is stated that a study of the temperature record of Vienna, 1776–1919, confirms for that region the existence of a 16-year period and indicates other possible periods, as, for example, periods of 33.8, 8, and 3.5 years. The 16-year period holds for middle and south Europe, but to the north it is first lost and then reversed in phase. "The amplitude is a maximum in mid-Europe and decreases gradually north and south. Stations in mid-Europe and those in the north show the 16-yearly period in both summer and winter mean temperatures, but with opposite phase, and the winter amplitude is about double the summer one. At the maximum of the period in middle and south Europe a severe winter and a warm summer occur, and these relations are reversed at the minimum. At mountain stations a larger amplitude is found than for a valley station in the same latitude."

A dew areometer [trans. title], P. ANDRIANOV (*Nauch. Agron. Zhur. (Jour. Landw. Wiss.), 1 (1924), No. 9–10, pp. 630–633, fig. 1*).—A modified form of Kerner's areometer for measuring dew is described, and a series of observations with it are reported, indicating the reliability of the instrument.

Unlike use of climate by plants [trans. title], W. KÖPPEN (*Met. Ztschr. [Brunswick], 42 (1925), No. 6, p. 237*).—Referring to Scharfetter's article previously noted (E. S. R., 51, p. 717) on the response of plants to the climatic rhythm, it is pointed out that, as is to be expected, native plants utilize the rhythm better than introduced plants.

Protecting orchards from frost, J. B. KINCER (*Bul. Amer. Met. Soc., 6 (1925), No. 8–9, pp. 118–122*).—The subject is briefly discussed from the standpoint especially of practice in southern California, where as many as 10,000 heaters are used and $3,000 worth of oil is burned in one night in a single grove.

The service of the Weather Bureau in furnishing frost warnings and testing various heating appliances is noted. Various proposed means of protection are referred to, but it is stated that none of these has proved more effective than the ordinary orchard heater burning oil. Reference is also made to the investigations of the Weather Bureau in regard to regulating orchard heating on the basis of the temperature of the fruit rather than that of the air. "Usually the freezing point of a mature orange is about 27° [F.], and as the temperature of the fruit lags considerably behind that of the air when the weather is getting colder, it may sometimes happen that when the low temperature is of short duration it may reach a rather low degree and warm up again without actually freezing the fruit. These experiments have not been carried far enough to reach any definite conclusion." A high degree of accuracy has been attained in the forecasting of freezing temperatures.

Weather and agriculture, A. J. HENRY, J. B. KINCER, H. C. FRANKENFIELD, W. R. GREGG, B. B. SMITH, and E. N. MUNNS (*U. S. Dept. Agr. Yearbook, 1924, pp. 457–558, 1206–1230, figs. 44*).—This article deals broadly with influences which control or modify the weather and the effect of weather on soil conditions and plant growth; the varying weather conditions in different parts of the United States and the adjustments thereto of crops, cropping system, and farm work; as well as the storage, transportation, and marketing of farm

products. There is specific discussion of the relation of weather to corn, wheat, oats, and other grains, cotton, forests, and livestock. The special weather and crop services of the Weather Bureau are described.

Tables are also given showing monthly normal and mean temperature and normal and total precipitation at selected points in the United States, 1913 to 1924, as well as dates of killing frosts and length of growing season.

Weather [conditions at the Rhode Island Station, 1924], (*Rhode Island Sta. Rpt. 1924, pp. 1, 2*).—Brief comments are made on temperature, precipitation, and killing frosts. The season was abnormally cool in May. The frost-free period extended from April 12 to October 14. The minimum night temperatures in autumn were decidedly higher at the station on Kingston Hill than on the experimental plats on the plains 1 mile distant and at about 130 ft. lower level. June and October were abnormally dry.

Meteorological observations (*West Indies Imp. Dept. Agr., St. Lucia Agr. Dept. Rpt. 1923, pp. 22–25, fig. 1*).—Observations on temperature, humidity, vapor pressure, and cloudiness at the experiment station at Reunion, St. Lucia, and on rainfall at various other places as well, during 1923 are reported.

The rainfall, 71.57 in., was 19.13 in. below the average for 24 years and marked the close of the drought conditions of the previous year. At certain stations rain fell on many days, but the total precipitation was below normal and many of the light rainfalls were of little value. It is shown that drought conditions are evident in the island when the rainfall is less than 60 to 70 in. per annum.

Rainfall and temperature of Cuba, O. L. Fassig (*Trop. Plant Research Found. [Wash., D. C.] Bul. 1 (1925), pp. 32, figs. 7*).—The monthly and annual temperatures at 10 places in Cuba are summarized in tables, and salient features of the rainfall are brought out by means of diagrams, tables, and brief comment.

It is shown that Cuba is a region of comparatively uniform and moderately high temperatures, which are always safely above the freezing point. The rainfall is more variable but shows a high degree of dependability during the usual crop growing months, May to November. Since 1900 the average rainfall has never been less than 2.5 in. for any month during this period. Rainfall is evenly distributed geographically but is heavier in the western than in the eastern provinces. The minimum rainfall occurs in January or February with a steady increase to a maximum in May or June, followed by a decrease in July, with a secondary maximum in September or October.

SOILS—FERTILIZERS

The maximum water-retaining capacity of colloidal soils; the interpretation of this and of certain other soil moisture constants, F. Hardy (*Jour. Agr. Sci. [England], 13 (1923), No. 3, pp. 340–351*).—In a contribution from the Imperial Department of Agriculture of the British West Indies, an investigation into the applicability of the Briggs-Shantz relationship connecting maximum water-retaining capacity with hygroscopic coefficient to soils containing appreciable amounts of colloidal matter of different specific nature is reported.

The results indicated that the Briggs-Shantz equation $M=4.3H+21$, in which M is the maximum water-retaining capacity and H is the hygroscopic coefficient, while generally applicable to soils the colloidal properties of which are not marked, yields values for the calculated maximum retentivity constant that are considerably below the experimentally determined values

when applied to highly colloidal soils containing siliceous colloids. This result is believed to be due mainly to the marked volume expansion exhibited by these soils when wetted.

In the case of red lateritic soils, in which the colloid content is composed mainly of alumina hydrogel and ferric oxide hydrogel, the calculated values for the maximum retentivity constant were, on the contrary, found to be in excess of the estimated values. These soils, though highly colloidal, exhibited a remarkably low volume expansion on wetting.

In the siliceous West Indian soils examined, the vesicular coefficient appeared to vary between 4.9 and 3.3, with a mean value of 4.2, whereas for red lateritic soils it varied between 3.5 and 2.4, the lowest figure being given by the most typical of these. The low vesicular coefficient of the colloidal material that characterizes the lateritic soils is believed to account partly for the discrepancy between the calculated and estimated values for the maximum retentivity constant.

A new formula connecting maximum water-retaining capacity with total bound water and with free interstitial film water was also tested. In this formula total bound water is represented by the moisture content of the soil at the point of stickiness, it being believed that at this stage the soil colloids are completely saturated with water. The results obtained indicated that this formula also fails to yield results in concordance with experimental data, except in the case of lateritic soils, for which it seemed to apply quite closely. The main reason for failure in the application of the new formula to colloidal soils containing siliceous colloids again appeared to be the marked volume expansion which these soils exhibited when wetted. Results in general agreement with those obtained with soils containing inorganic colloids were yielded by two highly humic soils.

The bearing of the theories and results discussed on the significance of other soil moisture constants, namely, the wilting coefficient, the moisture equivalent, and the critical moisture constant, was examined. The importance of recognizing specificity in soil colloidal material is emphasized.

Water displacement of soils and the soil solution, J. S. Burd and J. C. Martin (*Jour. Agr. Sci. [England], 13 (1923), No. 3, pp. 265–295, fig. 1*).—Studies conducted at the University of California on the subject, using three sandy soils and two clay loams, are reported, in which it was found that the use of a positive air pressure on closely packed soils decreases the time of recovery and increases the yields of solution obtained by water displacement. Successively displaced solutions of equal electrical conductivity were obtained from each soil. The concentration thus measured was in each case the same as that of the liquid obtained without the use of displacing water.

Concentrations of individual ions in successive portions of displaced solutions were uniform in soils at optimum and at half optimum. There was an inverse proportion between total moisture content of soil and concentration of the displaced solution as indicated by measurements of specific resistance.

When the solution displaced by water from a given mass of soil was used as a displacing agent on another portion of the same soil, the newly displaced solution had the same concentration of electrolytes as the displacing solution. This is taken to indicate that the displaced solution had the same concentration as the solution with which it came in contact in the soil.

Evidence is presented which tends to show that compacted soils become completely saturated during displacement, and that the mechanism of displacement consists in an actual translocation of successive layers of liquid.

The volume-changes associated with variations of water content in soil, W. B. Haines (*Jour. Agr. Sci. [England], 13 (1923), No. 3, pp. 296–310, figs.*

7).—In a contribution from the Rothamsted Experimental Station a new and simple method of measuring the shrinkage of moist soil on drying is described, which at the same time gives values for the port space and specific gravity of the soil. Diagrams for a number of diverse soils are given, illustrating the character of soil shrinkage. The shrinkage is shown to take place in two stages, in both of which there is a linear relationship to the moisture content. Tentative explanations of these two stages are advanced, based on the colloid coating hypothesis, and confirmatory experiments are described. By means of the method the effect of alternate wetting and drying of soil in producing good tilth is illustrated.

The hydrogen-ion concentration of heavy alkaline soils, A. F. Joseph and F. J. Martin (*Jour. Agr. Sci.* [*England*], *13* (*1923*), *No. 3, pp. 321–332*).—Studies conducted at the Wellcome Tropical Research Laboratories, Khartum, are reported, which showed that the colorimetric method is unsuited to the examination of heavy alkaline soils owing to the turbidity of the suspension. Where the nature of the suspension permitted colorimetric determinations, they agreed with those obtained electrometrically.

It was found that no disturbing effect is likely to be introduced by amounts of nitrate up to 500 parts per million of soil. It is concluded that the proportion of water and time of extraction should be fixed owing to their effect on the pH of the soil suspension caused by varying these conditions. On account of the buffer nature of clay, soil shifts the reaction of acids and alkalies in the direction of neutrality. The effect of sodium salts on a soil was to displace aluminum and so reduce alkalinity. The residual soil after leaching was found to be more alkaline. The effect of drying alkaline soil was to cause the pH of the extract to be lower than that obtained from the undried soil. If, however, the time of extraction was prolonged the differences disappeared almost entirely.

Soil survey of Natchitoches Parish, Louisiana, J. A. Kerr et al. (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1921, pp. III+1395–1441, figs. 2, maps 2*).—This survey deals with the soils of an area of 809,600 acres lying in the high prevailingly rolling interior Gulf Coastal Plain region in northwestern Louisiana. The uplands, which constitute more than half of the total area, are mainly of rolling or hilly topography. The drainage ways over considerable areas are only slight depressions, and the drainage is imperfect.

The soils of the area are light in color, and the predominant material is rather heavy clay. Including riverwash, 44 soil types of 24 series are mapped, of which the Susquehanna fine sandy loam and the Miller clay cover 13.1 and 11.5 per cent of the area, respectively.

Soil survey of George County, Mississippi, W. E. Tharp and E. P. Lowe (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1922, pp. III+33–75, pls. 2, fig. 1, map 1*).—This survey, made in cooperation with the Mississippi Geological Survey, deals with the soils of an area of 304,000 acres lying within the Coastal Plain region in southeastern Mississippi. The county lies entirely within the long-leaf pine region of the State. The topography of the greater part of the county is rolling to moderately hilly, with a few very small areas of hilly to broken land.

The soils of the greatest agricultural importance are said to be the so-called red lands. Including muck and swamp, 31 soil types of 16 series are mapped, of which the Ruston and Orangeburg sandy loams and the Ruston loamy sand cover 16.1, 11.8, and 10.3 per cent of the area, respectively.

Soil survey of Cumberland County, North Carolina, S. O. Perkins et al. (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1922, pp. III+111–151, fig. 1, map 1*).—This survey, made in cooperation with the North Carolina

Department of Agriculture and Experiment Station, deals with the soils of an area of 414,080 acres lying in the higher part of the Coastal Plain region in south-central North Carolina. The county embraces three distinct topographic and soil regions, namely, sand hills, flatwoods, and bottoms. The sand-hill section is confined mainly to the northern and northwestern part of the county. In this region the soils are prevailingly sands or light sandy loams. The flatwoods region occupies the southern and eastern parts of the county. The bottomlands are developed mainly throughout the central part of the county.

Most of the soils of the county are light in color and are relatively deficient in organic matter, due to good drainage conditions and a forest cover. Including swamp, 40 soil types of 21 series are mapped, of which the Norfolk sand covers 24.1 per cent of the area.

The brown loess soils of Missouri and their utilization, H. H. Krusekopf (*Missouri Sta. Bul. 235 (1925), pp. 55, pls. 4, figs. 23*).—Some of the results of a reconnaissance survey of the brown loess soils of Missouri are reported, together with information on the adaptability of these soils to different crops, with particular reference to their utilization for fruit growing. These soils are said to cover approximately one-eighth of the area of the State. They are generally characterized by deep, mellow, silty surface soils and open, friable, silty clay subsoils. Their favorable physical properties and high fertility are said to make them productive and adaptable to a great variety of crops, especially deep-rooting crops such as legumes and fruits.

Getting results from peat lands (*Minnesota Sta. Rpt. 1924, pt. 3, pp. 21–25, figs. 5*).—Data from four experimental fields on peat are briefly reported and discussed.

[Soil fertility studies at the Rhode Island Station] (*Rhode Island Sta. Rpt. 1924, pp. 2–5, 9–11*).—The progress results of experiments on supplying organic matter to the soil, the efficiency of fertilizers and other manures, the effect of crops on one another, and the modification of sour soils are briefly summarized (E. S. R., 51, p. 725.)

Development and value of Kentucky blue grass pastures, J. W. White and F. J. Holben (*Pennsylvania Sta. Bul. 195 (1925), pp. 24, figs. 6*).—Data furnished by fertility experiments on Dekalb, Volusia, and Westmoreland soils in support of the establishment and maintenance of highly productive blue grass pasture are reported (E. S. R., 45, p. 214).

It is shown that although the climate of Pennsylvania is well adapted to the growth of Kentucky blue grass, the soils are too deficient in lime and phosphorus. The maximum growth of blue grass was obtained on soils treated with limestone and a complete fertilizer. Rock phosphate applied in quantities sufficient to carry four times as much phosphoric acid as acid phosphate produced more Kentucky blue grass during the second four years of the experiment than acid phosphate, and twice the yield of sweet clover.

During the years the fertilizers were applied, nitrogen added to a soil treated with calcium, potassium, and phosphorus gave an average increased yield of 74 per cent. However, nitrogen showed practically no beneficial residual effect the second year as compared with the phosphorus and potassium treatments. Nitrogen applied as sodium nitrate hastened the spring development of blue grass, shortened the resting period during the hot summer months, and prolonged the late fall growth. The yields on plats treated with calcium, phosphorus, and potassium were limited by the rate of nitrification and not by the total amount of nitrogen present.

Over three times as much crude digestible protein was produced with complete fertilizer on pasture as was produced on the same acreage in a grain rotation.

On Dekalb soil, at the end of eight years of cropping, the organic matter content of the surface soil under Kentucky blue grass increased 27.5 per cent as compared to 16.7 per cent with the same treatment in grain rotation. The organic matter content of pasture soils treated with calcium, phosphorus, and potassium increased 48.5 per cent as compared with 17.1 per cent in a rotation soil. The annual rate of nitrogen fixation in the pasture soil so treated was 135 lbs. per acre as compared with 37 lbs. per acre under rotation. The addition of sodium nitrate reduced the rate of nitrogen fixation both in the pasture soil and in the soil in grain rotation.

The annual loss of limestone carbonates from pasture soil was 485 lbs. per acre and 600 lbs. per acre from rotation soil. Three tons of limestone per acre applied to Dekalb pasture soil maintained an alkaline soil reaction for eight years to a depth of 3.5 in. The soil below that depth was little affected by the limestone.

A study of the secondary effects of hill fertilization, H. J. Harper (*Iowa Sta. Research Bul. 87 (1925), pp. 223–251, figs. 4*).—Field, laboratory, and greenhouse studies of the secondary effects of hill fertilization on several different loam, silt loam, and coarse sand soils are reported.

Acid phosphate was found to have a more pronounced effect on the H-ion concentration of the soil solution than either ammonium sulfate or potassium chloride. In most cases the first effect of acid phosphate was to increase the acidity of the soil solution. In poorly buffered soils, such as sands or sandy loams, this increased acidity may persist for some time. In other soils the acidity is neutralized very quickly, and sometimes a less acid solution than that of the untreated soil may be produced.

The effect of hill fertilization on carbon dioxide production was found to be slight on loam and silt loam, while a decrease occurred on a sandy soil.

Hill fertilization did not cause any accumulation of ammonia in the soils studied. The accumulation of nitrates in the sandy soil was retarded, while in the loam and silt loam no appreciable increase or decrease occurred. The organic nitrogen of the soil was nitrified more readily than nitrogen added as ammonium sulfate in the case of two acid soils, while in one strongly acid soil no nitrification of the nitrogen in the soil or in the ammonium sulfate occurred. When two basic soils were treated with ammonium sulfate and with mixtures of acid phosphate and potassium chloride, a more rapid nitrification of the nitrogen in the ammonium sulfate occurred than from the organic nitrogen in the soil.

Watering Carrington loam and Webster silt loam soils in amounts equivalent to 1 in. of rainfall had very little effect on the leaching of nitrates or other plant nutrients. A rain of 2.56 in. caused a considerable movement of nitrates in two different soils.

Hill applications of phosphorus in a Carrington loam were leached slightly by 1 in. of rain. During a whole season, in which 15.27 in. of rain fell, the phosphorus in 16 per cent acid phosphate was not leached to a depth greater than 2 in. in a Webster silt loam or greater than 4.5 in. in a Carrington loam. Potassium was leached into the lower layers of soil more rapidly than phosphorus when applied in the surface layers.

A large percentage of the phosphorus applied in the hill was not utilized by corn plants. No decrease in root development was detected between fertilized and unfertilized plants when the rate of hill fertilization did not

exceed 200 lbs. per acre and the nitrogen content of the fertilizer did not exceed 3 per cent as ammonia.

Comparative tests of nitric nitrogen applied alone and of ammoniacal nitrogen in the presence of partial sterilization on crop yield [trans. title], G. RIVIÈRE and G. PICHARD (*Compt. Rend. Acad. Sci.* [*Paris*], *180* (*1925*), *No. 13, pp. 1054–1056*).—Studies are reported which showed that ammonium sulfate, when used with salts producing partial sterilization of soil, gave better crop yields than ammonium sulfate alone or sodium nitrate alone. This is attributed to the increased nitrification immediately following partial sterilization.

Persistence of dicyanodiamide nitrogen in calcium cyanamide in stick form after a long period in soil [trans. title], A. AUGUET and A. BRUNO (*Compt. Rend. Acad. Sci.* [*Paris*], *180* (*1925*), *No. 19, pp. 1436–1438*).—Experiments are briefly reported showing that calcium cyanamide in stick form contained about 1 per cent of dicyanodiamide nitrogen after seven months in the soil as compared to 7 or 8 per cent in fresh calcium cyanamide.

Absorption and leaching of nitrogen after fertilization with urea and ammonium chloride [trans. title], C. H. VAN HARREVELD-LAKO (*Arch. Suikerindus. Nederland. Indië, Meded. Proefsta. Java-Suikerindus., 1924, No. 8, pp. 261–267, figs. 6*).—Studies with six soils are reported which showed that the leaching of ammonium chloride and ammonium sulfate was quite small after a watering of 21 cm. (8.27 in.), averaging around 1 per cent. An average of 88 per cent of the nitrogen of urea was leached out, however, and it is concluded that urea and sodium nitrate are little different in this respect. Urea was absorbed to a certain limited extent by some soils, probably owing to their humus content.

Some properties of urea in its action on soil [trans. title], F. COUTURIER and S. PERRAUD (*Compt. Rend. Acad. Sci.* [*Paris*], *180* (*1925*), *No. 19, pp. 1433–1436*).—Studies are reported on the absorption and biological transformation of urea in soil.

A plain solution of urea was found to be somewhat absorbed by soil, but treatment of soil with a solution containing chloroform and urea resulted in practically no urea absorption. Urea nitrate was absorbed no better by soil. Urea was found to be almost totally transformed into ammonia in soil within 24 hours. At low temperatures this transformation was essentially proportional to the time.

These results are considered to have an important bearing on the practical use of urea as a fertilizer, with particular reference to season and temperature.

The new fertilizers phospho-nitrogen and urea [trans. title], A. COCHET (*Chim. et Indus.* [*Paris*], *Spec. No., May, 1924, pp. 394–403, figs. 3*).—The chemical reactions involved in the manufacture of this nitrogenous phosphatic fertilizer are outlined. These include the carbonation, hydration, and concentration of a cyanamide solution and the treatment of this solution with a phosphate.

Disaggregated phosphates in Belgium [trans. title], J. GRAFTIAU (*Chim. et Indus.* [*Paris*], *Spec. No., May, 1924, pp. 678–683*).—Studies conducted at different Belgian experiment stations with disaggregated phosphates, such as Vesta and Supra phosphates, are briefly reported.

The results indicated the relatively high fertilizing value of such phosphates in so far as they are soluble in ammonium citrate solution. They also showed that certain of these phosphates, which were only 50 per cent citrate soluble, were as high in fertilizing value as higher grade phosphates, the phosphoric acid content of which was 90 per cent citrate soluble.

The potash content of disaggregated phosphates, while insoluble in water, had a beneficial influence on crops. The basicity of these phosphates was a

favorable characteristic with reference to plant growth, which was more marked than with basic slag.

Comparative assimilabilities of tricalcium phosphate and phosphates of aluminum and iron [trans. title], C. Brioux (*Chim. et Indus.* [*Paris*], *Spec. No., May, 1924, pp. 687–690*).—Experiments are reported which showed that aluminum phosphate was slightly superior to tricalcium phosphate in the production of dry matter, and markedly superior with reference to the assimilation of phosphoric acid by crops. Iron phosphate was less available to crops than either calcium or aluminum phosphates, although it was utilized to a considerable extent by barley and buckwheat.

Comparison of the actions of sodium chloride, potassium chloride, and rich sylvinite on cultivated plants [trans. title], P. Lesage (*Ann. Sci. Agron. Franç. et Étrang., 42 (1925), No. 3, pp. 172–190, pl. 1*).—Continuing work previously reported (E. S. R., 51, p. 818), laboratory and garden studies of the comparative influences of sodium chloride, potassium chloride, and sylvinite on crops are reported.

Distilled water condensed in metallic serpentine was found to be toxic. This toxicity was not uniform for the different portions of a long time distillation in the same still, and it was not always neutralized by dissolving salts in the water. Sodium chloride and potassium chloride of the same molecular concentration gave essentially the same results. In strong concentrations, toxic to plants, the sodium chloride was no more toxic than the potassium chloride, while in weak concentrations the action of the sodium chloride was no less favorable to plants than that of potassium chloride.

Strong, toxic concentrations of rich sylvinite were less toxic than solutions of potassium chloride of equal molecular concentration, while in useful concentrations the sylvinite gave better results than potassium chloride.

Action of alkaline carbonates and alkaline earths on soil acidity [trans. title], V. Vincent (*Compt. Rend. Acad. Sci.* [*Paris*], *180 (1925), No. 7, pp. 534–536*).—Experiments on the effect of calcium oxide, calcium carbonate, calcium sucrate, and the carbonate and bicarbonate of sodium on the reaction of acid soil growing wheat, buckwheat, and clover are briefly reported.

The results showed that the necessary amounts of such materials determined analytically were insufficient for exactly neutralizing the soil acidity, and that after the crops were harvested, around 50 per cent of the original acidity remained in the soil.

It is concluded that certain crops, such as clover, leave the soil more acid than wheat or buckwheat because of their greater demand for calcium, and in addition that the free lime, in spite of its affinity for the acid colloids of the soil, neutralizes the true acidity first. Calcium carbonate is considered to be the best neutralizer of soil acidity.

Manner of the transformation of caustic lime in soil and its cause [trans. title], F. Scheffer (*Jour. Landw., 72 (1924), No. 4, pp. 201–235*).—Studies are reported which showed that in soils deficient in lime and in such soils having a neutral reaction, the transformation of calcium oxide into calcium carbonate is not quantitative and a considerable portion of the calcium oxide is otherwise fixed. A quantitative transformation of calcium oxide into calcium carbonate was observed only in soils rich in calcium carbonate. The completion of the quantitative process was hindered by the presence of absorptive substances in soil. Silica gel and a mixture of silica and alumina gels were active in this respect, and the silica gel was able to break down calcium carbonate.

Use of peat as a fertilizing material [trans. title], C. Berthelot (*Chim. et Indus.* [*Paris*], *Spec. No., May, 1924, pp. 684–686*).—Experiments are reported

which showed that peat, when used in a mixture with cyanamide in amounts ten times that of the cyanamide, protected seed against the injurious influence of the cyanamide. It was even more effective in alkaline soil.

AGRICULTURAL BOTANY

[Report of the Carnegie Institution on] botany (*Carnegie Inst. Wash. Yearbook 22 (1922–23), pp. 288–290*).—Three studies are noted:

Studies of the Cactaceae, N. L. Britton and J. N. Rose.—The work of the year has been devoted mainly to the fourth and last volume of the Cactaceae, a monograph under preparation since 1912.

Studies upon the influence of solar radiation on the rate of transpirational water-loss from plants, B. E. Livingston.—The author claims the plant environment acts directly to influence the transpiration rate only through those variable aerial and meteorological conditions that affect the rate of vaporization of water, which are the conditions that determine the rate of evaporation from a water surface or the rate of diffusion of water vapor. The aerial conditions here dealt with may be considered in two categories, the evaporating power of the air (the combined influences of air temperature, air humidity, and air movement) and the evaporating power of impinging radiation. "A feature brought out in these studies is that the influence of indirect solar radiation (radiation not received directly from the sun, but coming from the rest of the sky, from the earth, etc.) is not at all to be neglected in discussions of the influence of sunshine on plant transpiration."

Continuation of investigations on permeability in cells, W. J. V. Osterhout.—Experiments employing cells of a species of Nitella, which sometimes reach a length of 6 in., are said to have demonstrated that, contrary to the views of many investigators, certain salts are able to penetrate protoplasm in its normal state. Chlorides are absorbed by Nitella from the water and stored within the cell, where the concentration may be 50 to 100 times as great as in the external solution. When the cell is injured the chlorides begin to diffuse out. By making frequent measurements a time curve may be obtained. The mathematical analysis of the curve indicates that the process of injury, followed by death, follows a definite law which appears to be the same as that derived from measurements of the electrical conductivity of the cells.

[Report of the Carnegie Institution] laboratory for plant physiology, D. T. MacDougal et al. (*Carnegie Inst. Wash. Yearbook 22 (1922–23), pp. 43–66, fig. 1*).—The activities of the laboratory have been devoted to three main studies—photosynthesis and metabolism, permeability and growth, and certain ecological relations of plants. Progress has been made in the study of some special problems as noted below.

Dendrographic records of growth in trees, D. T. MacDougal.—The dendrographic results in connection with the measurements of trunks established the fact that the thickness of the layer of wood formed in the Monterey pine does not correspond directly with the rainfall of the season of its formation, of the previous season, or of any known phase of such precipitation. In the yellow pine the amount of wood formed in any year does show a fairly close correspondence to the amount of precipitation.

Formation of wood (and growth in general) is the result of the integrated or correlated action of several factors, including soil moisture, temperature, light, and food supply.

The woody cylinder of a living tree shows a daily variation in diameter, while trunks of dead trees show no variations of measurable degree.

Stem analysis of Monterey pine and redwood, F. Shreve.—The work on the Monterey pine and redwood in the vicinity of the Coastal Laboratory has been continued, and has shown a very close correspondence between the course of the growth graph based on stump measurements and that based on the average of 10 transverse sections in the lowest 30 ft. of the trunk. This strengthens the reliability of data from the stump section alone as a criterion of the performance of the trunk as a whole.

Preliminary data afford some evidence that rainfall is of greater importance than temperature in the growth of young trees, and that temperature is of greater importance than rainfall in the case of mature trees. In the case of the Monterey pine, growing in its native coastal habitat, there is no evidence that rainfall is a dominant and constant condition determining the annual increment of woody tissue.

Growth as a problem in permeability, D. T. MacDougal.—The author conceives the cell of the plant in its earliest stage as a "solid" unit of colloidal material which increases by the formation of new particles or ions of substances such as pentosans, albumins, lipins, or soaps within its mass. This accretion stage accounts for only a small fraction of the total volume of the plant or tissue, the greater part of the expansion or measurable growth of the plant being due to the distention or ballooning of the cells, which show spaces or cavities formed with the protoplasm and enlarged by the pressure of the water which is drawn into them by the osmotic action of sugars and other organic compounds and salts.

Measurement of changes due to hydration of colloids, to altered permeability, and to growth, D. T. MacDougal.—The methods employed and results obtained are briefly indicated.

Effect of salt solutions on hydration and swelling of plant tissues, F. T. McLean.—A study of the swelling of plant tissues in salt solutions is said to indicate that the difference observed in the behavior of stem tips of *Juglans major* and *Rubus vitifolius* was due to the manner of preparation of the material for testing. The results indicate also that the different tissues comprising the young stems do not react in the same manner to the salt solutions. A suggestive parallelism is pointed out as existing with the absorption rates by artificial cells in similar solutions. The epidermis on the stem tips of blackberry appears to exert an influence on their swelling which is strikingly similar to the effect of a pectinized outer layer on the absorption of the artificial cells.

Relative effects of common metals in producing contraction, expansion, and plasmolysis of cell-masses, D. T. MacDougal.—Tests made with joints of Opuntia are indicated, and the advantages of the method of auxographic measurement are pointed out.

Relative effects of some common ions on hydration, absorption, and permeability, D. T. MacDougal.—That the action of the common soil salts on plants is in the main determined by the ionic mobility of the particles, with modifications due to the varying composition of the living material and with interferences, is suggested by data presented.

An improved electrometric method of determining carbon dioxide for photosynthesis investigations, H. A. Spoehr and J. M. McGee.—It is claimed that a method based upon the differential determination of the concentration of CO_2 in the medium surrounding the plant affords the easiest, as well as the most accurate, method of determining the rate of carbon dioxide fixation by the plant.

Effect of fluctuations in the CO_2-content of the atmosphere on the rate of respiration of leaves, H. A. Spoehr and J. M. McGee.—It has been found that changes in the partial pressure of the carbon dioxide surrounding plants have a profound influence on the rate of carbon dioxide emission.

The intensity of the increased or decreased rate varies with different species of leaves, as does also the duration of the effect of the change. These results substantiate the opinion that determinations of the rate of photosynthesis in a closed system of air yield spurious results.

The absorption of CO_2 by the leaf material, H. A. Spoehr and J. M. McGee.—An investigation was undertaken to determine the nature of the substance which absorbs or adsorbs relatively large amounts of CO_2. Leaves of different species vary considerably in their absorptive capacity, the variation being less in leaves which have been illuminated than in those not illuminated. Thorough extraction with cold water removes about 30 per cent of the absorptive material, the concentrated extract also absorbing this quantity of CO_2. Extraction with hot water greatly reduces the absorptive capacity of the leaf material. The concentrated hot-water extract absorbs very little CO_2. Extraction with hot alcohol reduces slightly the absorptive capacity.

The reduction of carbon dioxide, A. Locke.—There is said to be some evidence that a purely chemical reduction of carbon dioxide is associated with the photochemical reduction which takes place in plants, iron acting as a catalyst. Tests were made of methods proposed for the reduction which might conceivably act as a result of peroxide decomposition. Repetition of the work of several observers failed to confirm the occurrence of reduction in any significant quantity. Considerable reduction, however, does occur at high pressures.

Effect of ultra-violet light on carbamino acids, H. A. Spoehr and A. Locke.—The photochemical reduction of carbonic acid and its salts to formaldehyde having thus far given negative results, an attempt was made to determine whether solutions of carbamino acids are capable of undergoing photoreduction. During the periods of illumination used, no trace of formaldehyde, ammonia, or hydrogen peroxide could be obtained from glycocoll or alanine.

The illumination of ice-cold solutions of the calcium salts of glycocoll and alanine carbaminate resulted in the formation of slight traces of ammonia and of formaldehyde, as well as small quantities of methyl alcohol. The results appear to indicate that the conversion of amino acids into calcium carbaminates renders them more sensitive to photooxidation, but does not facilitate the reduction of the bound carbonic acid to formaldehyde or its equivalent.

Oxidation of glucose by means of air, H. A. Spoehr.—The chemical reactions resulting in the complete oxidation of glucose in the manner here indicated are undoubtedly very complex, involving a number of steps, some of which are indicated.

Isolation of phosphatides from Opuntia discata, E. B. Working.—Complete precipitation of the phosphatide from the original aqueous solution was obtained, but attempted repetition was not successful.

Experimental investigations on roots, W. A. Cannon.—The results are given of introductory studies on the relation of roots growing in a deficiency of oxygen in the atmosphere of the soil to the soil temperature. The investigations at present are confined wholly to roots, and no attempt is made to control the subaerial environment.

Internal factors governing the seasonal changes in the transpiration of Encelia farinosa, E. B. Shreve.—Experiments are said to show that the difference in anatomical structure of the mesophytic and xerophytic leaves does not account for the greater resistance to water loss during the arid season. The

total imbibitional capacity of both types of leaves varies with the original water content and with the dry weight. The less the original water content the greater the amount of soluble material that diffuses into the water which surrounds imbibing disks. The evidence makes it probable that in the attached leaf the differences in water content are accompanied by similar changes in the amount of soluble material that passes out of the leaf by diffusion to other parts of the plant. The combined action of the external and internal factors is such that the ratio of evaporation to soil moisture affects the water content of leaf tissue; this affects the imbibitional capacity, and it in turn affects the resistance to water loss exhibited by the leaf tissue.

Ecology of the Santa Lucia Mountains, F. Shreve.—In continuation of work on the vegetation of the Santa Lucia Mountains, considering the ratio of evaporation to soil moisture an index of the aridity of a habitat, it is noted that the value for the most xerophytic habitat in close proximity to the sea is little more than one-third as great as that for Chew's Ridge, where the summit is dominated by a similar type of chaparral and the adjacent slopes by an open stand of Coulter pine. Comparison with the same factors for Tucson indicates that the soil and atmospheric conditions make the maintenance of a balance between water income and water outgo 126 times as difficult in the habitat of the giant cactus as in that of the redwood.

Bacteria in arid soils, L. M. Snow.—This work was undertaken in order to compare the types of bacteria in arid soils exposed to different climatic conditions in localities which are indicated, and at different depths.

[Report of the Carnegie Institution on climatology and tree growth] (*Carnegie Inst. Wash. Yearbook 22 (1922–23), pp. 299–301*).—Two contributions correlating climate and tree growth over short or long periods are noted.

The big tree as a climatic measure, E. Antevs.—A study of *Sequoia washingtoniana*, begun in 1923, is outlined as applied to trees growing on high and more or less dry ridges and in moist valleys in or near water. The parts of the curves from wood aged between 1,301 and 2,100 years were added, as were also, separately, the parts younger than 1,301 years, and a curve of the whole "dry" and "moist" material was secured. A curve obtained in a somewhat different way is also described. The variations of the final corrected curves may be due largely to changes in climate and weather.

The chief climatic factors influencing growth appear to be precipitation, temperature, and sun radiation, the relative rôle of each factor being dependent on the time for its effect, upon other factors, upon internal conditions in the tree, etc. Thus growth can primarily follow now this, now that factor. It is thought that the length of the postglacial time (about 8,500 years) may be exactly determined.

The big trees as a climatic yard-stick, E. Huntington.—The purpose of this investigation was to test the supposed relationship between rainfall and the growth of the big trees by means of correlative coefficients. The general conclusion is that the big trees, when studied by the method of correlative coefficients, show that they can properly be used as a climatic yardstick for certain areas in various parts of the world, but not for other intervening areas.

Another phase of the present study indicates that the rainfall of the second or third year previous to the growth of the trees has the greatest effect on growth. Where trees grow in moist places the rainfall for as long as 10 years has some effect.

[Report of the Carnegie Institution on] ecology, F. E. Clements et al. (*Carnegie Inst. Wash. Yearbook 22 (1922–23), pp. 302–322*).—This report deals with studies extending over a wide range of variety and including among

others The Phytometer Method, by F. E. Clements and G. W. Goldsmith; Slope-Exposure Studies, by F. E. Clements and D. Lutjeharms; The Water Cycle in Plants, by F. E. Clements and J. V. G. Loftfield; Studies in Aeration, by F. E. Clements and G. W. Goldsmith; Physical Properties of the Sap of Engelmann Spruce, by G. W. Goldsmith and J. H. C. Smith; Experimental Pollination, by F. E. Clements and F. Long; Translocation and Storage in Autumn, by F. E. Clements, F. Long, and J. V. G. Loftfield; Factors Involved in Opening and Closing of Flowers, by G. W. Goldsmith; Experimental Vegetation, by F. E. Clements and J. E. Weaver; Water-Loss from Vegetation in its Normal Soil relation, by J. E. Weaver and J. W. Crist; Plant Production as a Measure of Environment, by J. E. Weaver; Relation of Holard to Root Development and Yield, by F. C. Jean and J. E. Weaver; Destrnction of the Range by Prairie Dogs, by W. P. Taylor and J. V. G. Loftfield; Soil Fauna, by G. W. Goldsmith; Principles and Methods of Bioecology, by F. E. Clements and W. P. Taylor; Climax Formations, and Changes in Grassland, both by F. E. Clements and E. S. Clements; The Original Vegetation of Death Valley, Application of the Relict Method, and Rainfall and Climatic Cycles, all by F. E. Clements; Biotic Succession in Bad Lands, and Succession in Dunes and Sandhills, both by F. E. Clements; Permanent Quadrats and Transects, by F. E. Clements and J. V. G. Loftfield; and Grazing Research, by F. E. Clements, J. V. G. Loftfield, and H. M. Hall.

GENETICS

Animal genetics: An introduction to the science of animal breeding, F. A. E. Crew (*Edinburgh: Oliver & Boyd, 1925, pp. XX+420, pl. 1, figs. 66*).—The general field of animal genetics and breeding is covered in this monograph, the work being taken up under the following chapter headings: The factors and the germ plasm, extensions and modifications of the Mendelian hypothesis, the material basis, the genes and the chromosomes, the natnre of the gene and the expression of genetic action, the mechanism of sex determination, the physiology of sex differentiation, the sex ratio and the question of its control, exogamy and endogamy, the genetic aspects of fecundity and fertility, heredity and disease, and disputed beliefs. An extended bibliography is included.

The improvement of races of agricultural plants and live-stock and modern genetics, G. Brunelli (*Internatl. Rev. Sci. and Pract. Agr.* [*Rome*], *n. ser., 2 (1924), No. 3, pp. 523–553*).—A brief review of the progress made in working ont the fundamental laws of plant and animal genetics, with recommendations for an international organization to develop the subject systematically.

[Report of the Carnegie Institution] department of genetics, C. B. Davenport (*Carnegie Inst. Wash. Yearbook 22 (1922–23) pp. 67–125, figs. 4*).—Progress has been made in the induction of mutation, also in the further analysis of chromosome variation in relation to somatic variation. It is now possible to modify not only the processes of cell division and chromosome separation but also the composition of the individual chromosome. While the immediate consequence of such induced mutations is not always a new species, with its properties of multiple differentiating characters, intersterility, and constancy of traits, one class of inducible mutation does meet these conditions, namely, that of tetraploidy, in which the number of chromosomes is doubled. J. Belling found that in *Hyacinthus orientalist*(?) the chromosomes are really four of a kind, leading to the inference that this species originated by tetraploidy, the failure, somewhere in its (ancestral) history, of the divided

chromosomes in some parent cell to get into distinct daughter nuclei; in consequence of which fact the number of chromosomes in the nucleus is permanently doubled, the resulting new form thus fulfilling the criteria above indicated for a species.

Detailed reports are given on current investigations regarding interchromosomal mutation and related behavior, notably in Datura.

Regarding the inheritance of special traits, investigations on the physicochemical properties of the leaf tissue fluids of Egyptian and of upland cotton and of their hybrids are reported, as are also experiments on the genetical analysis of white seedlings in maize.

Studies on the comparative cytology of the annual and biennial varieties of Melilotus alba, E. F. CASTETTER (*Amer. Jour. Bot., 12 (1925), No. 5, pp. 270–286, pls. 3*).—A cytological study of microsporogenesis in the annual and biennial varieties of white sweet clover at the Iowa State College indicated that the two varieties are identical cytologically, although functionally distinct. Conclusions as to the exact method of the origin of the annual variety did not seem warranted by the evidence at hand.

The improvement of sugar cane through bud selection.—Report for 1924, A. D. SHAMEL ET AL. (*Hawaii. Sugar Planters' Sta. [Pub.], 1925, pp. [4]+120, figs. 58*).—A report of the progress of work noted earlier (E. S. R., 51, p. 640) also deals with the improvement of the pineapple through bud selection, related bud selection studies in citrus fruits, and bud mutations in other Hawaiian plants.

Studies of inheritance of earliness in certain Avena crosses, C. F. NOLL (*Pennsylvania Sta. Bul. 194 (1925), pp. 4–43, figs. 2*).—Earliness, as measured by time of heading, was studied in a number of generations in crosses involving 15 varieties and strains of oats pertaining to both *A. sativa* and *A. sterilis*.

Practically all of the F_1 plants headed at the same time as the early parent or earlier. In crosses wherein the F_1 plants headed with the early parents and the F_2 plants began to head with the early parents, the early parents appeared to have one or more dominant factors which were lacking in the late parents. In crosses in which the F_1 plants were earlier than early parents and the F_2 began heading before the early parents, each parent seemed to have dominant factors lacking in the other parents. This second condition applied also to the cross in which the parents headed together, but gave early F_1 plants and an F_2 population which began to head earlier than the parents. In these crosses earliness seemed due to a series of dominant factors which together had a cumulative effect. The homozygous races recovered included those earlier than the early parents, similar to the early parents, intermediate, and later than the late parents.

Correlations between length of spike and culm in wheat and certain characters of progeny, including yield, A. N. HUME, E. W. HARDIES, and C. FRANZKE (*South Dakota Sta. Bul. 214 (1925), pp. 15, fig. 1*).—Central culms and spikes borne thereon were measured in 256 plants of Marquis wheat (E. S. R., 51, p. 432) grown in 1919. Measurement of certain plant characters and yields in the four succeeding generations derived from these spikes gave indications that no correlation exists between the length of wheat heads and the yield of their progeny. Selection of long heads in a field does not seem to be a means of increasing the yield of a variety. Earlier studies with Bluestem wheat (E. S. R., 43, p. 235) led to similar conclusions.

Mosaic pericarp in maize, W. H. EYSTER (*Genetics, 10 (1925), No. 2, pp. 179–196, figs. 6*).—Mosaic pericarp, a coarse type of variegation, has the inconstancy typical of variegations. Many mosaic patterns, an inconstant dilute-red

or orange type, constant colorless, and constant red types originated in pedigreed cultures from a single parent corn plant were studied at the Missouri Experiment Station. These variations are inherited and form a series of multiple allelomorphs with the following order of dominance: Self-red, heavy mosaic pattern, light mosaic patern, orange, and colorless. The frequencies of the different color and pattern changes have been determined. The color and pattern variations in mosaic are similar to those found in other variegations (E. S. R., 53, p. 27). Deductions were made as to the mechanism of variegations and the nature of the gene.

A study of the inheritance of certain color characters in the Shorthorn breed of cattle, A. D. B. Smith (*Jour. Heredity, 16 (1925), No. 3, pp. 73–84, figs. 3.*)—The author has discussed the hypotheses which have been advanced by other investigators to explain the inheritance of color in Shorthorn cattle. It is shown that there is a 5.8 per cent error in the explanation of color on the basis of a monohybrid series in which red is incompletely dominant, white is recessive; and the heterozygote is roan. The main objections to this hypothesis are the reported occurrence of roans breeding true and the production of red calves in matings with white bulls and red cows. The former objection is considered doubtful, while the latter is thought to be due to some roans appearing very much like red animals.

A study of the inheritance of spotting based on the results of other investigators has indicated that spotting in cattle is inherited as a simple recessive to solid color. The inguinal spot seems to be inherited separately.

Colorsided cattle, C. Wriedt (*Jour. Heredity, 16 (1925), No. 2, pp. 51–56, figs. 12*).—Color-sided cattle described as having white extending from the forehead along the back to and including the tail, as well as white along the underline, are shown to be widely distributed among the various breeds of cattle, including zebus and yaks. Observations indicate that this character is inherited as a single Mendelian factor incompletely dominant to solid color, the pattern of the red pied Swedish breed and the Holstein-Friesian.

Albino water buffaloes, C. O. Levine (*Jour. Heredity, 16 (1925), No. 2, p. 66, fig. 1*).—The occurrence of water buffaloes having white hair but pigmented eyes is noted from certain parts of China.

Blue and white color in swine, F. A. E. Crew (*Jour. Heredity, 15 (1924), No. 9, pp. 395, 396, fig. 1*).—Matings of Large White boars with Large Black sows usually result in blue and white pigs, but occasionally a number of black and white pigs are produced. The author has formulated an explanation of this occurrence based on three pairs of factors; *B* determines black, *P* white spotting, and *D* dilutes black to blue. The Large Black is *BBppdd*, while the Large White is *bbPPDD*. The production of 50 per cent blacks and whites in some crosses is due to certain Large Whites being heterozygous for the dilution factor.

The inheritance of rumplessness in the domestic fowl, L. C. Dunn (*Jour. Heredity, 16 (1925), No. 4, pp. 127–134, figs. 7*).—The author briefly reviews the historical occurrence of rumpless fowls, and reports the results of studies of the mode of inheritance of this abnormality carried on at the Connecticut Storrs Experiment Station. Two types of rumplessness were apparent, the one being inherited as a single dominant Mendelian factor, while the other was accidental and nonhereditary.

Matings of rumpless × rumpless fowls produced only about 20 per cent of fertile eggs, while matings of rumpless females with normal males produced 46 per cent of fertile eggs. Some rumpless females never produced any fertile eggs, though mated for two years. The low fertility of rumpless fowls is

mainly attributed to the mechanical difficulties of copulation, though no proved homozygous rumpless birds have yet been found. The accidental rumpless birds have occurred in the regular station flock at the rate of 1 rumpless per 1,000 normals, though some stocks have produced larger numbers.

Inheritance of harelip, B. CUNNINGHAM (*Jour. Heredity, 15 (1924), No. 9, p. 370, fig. 1*).—A three-generation pedigree is presented which indicates that the character harelip is not inherited as a dominant character nor is it sex-linked or sex-limited.

Inherited abnormalities of the fingers, I–III, R. A. HEFNER (*Jour. Heredity, 15 (1924), Nos. 8, pp. 322–329, figs. 7; 10, pp. 432–439, figs. 9; 12, pp. 481–483, figs. 3*).—Three papers are presented.

I. *Symphalangism.*—Symphalangism, defined as a congenital anchylosis of the proximal phalangeal joints of some or all of the fingers, has been found to be inherited as a simple dominant Mendelian character. Certain variations including muscular adaptations are described.

II. *Short thumbs (brachymegalodactylism).*—Brachymegalodactylism, defined as an abnormally short thumb on one or both hands, has been found after studying four unrelated lines and five other instances to be mainly inherited as a Mendelian dominant character. The abnormality is due to an unusually short terminal phalanx. The relation of unilateral to bilateral brachymegalodactylism is not clear.

III. *Subterminal articulation in the proximal joint of the little finger.*—A peculiar crooking of the little finger which could not be straightened occurred on both hands of an individual and on one hand of its father. X-ray photographs showed that the termination of the proximal phalanx was curved.

Four generations of symphalangism, O. L. INMAN (*Jour. Heredity, 15 (1924), No. 8, pp. 329–334, figs. 5*).—The occurrence of this abnormality in individuals in each of four generations is noted, including X-ray pictures of the hands and feet of some of the individuals.

Hairless mice, F. B. SUMNER (*Jour. Heredity, 15 (1924), No. 12, pp. 474–481, figs. 3*).—The occurrence of mice which lose their hair at about 2 weeks of age is described from the Scripps Institution. Fertility among such mice has been found to be low, only 1 female having produced young. The results of breeding heterozygotes inter se and back-crossing them with hairless males indicated that this character behaves as a simple Mendelian recessive. A considerable deficiency in the hairless classes is accounted for on the basis of a supposed greater prenatal mortality, since hairless mice are naturally low in vigor. The litter sizes of back-cross broods containing hairless individuals averaged 4.0 as compared with 3.2 for litters containing no hairless animals.

Age of parents and order of birth in relation to longevity of offspring, S. J. HOLMES and I. WILSON (*Jour. Heredity, 16 (1925), No. 2, pp. 47–50*).—The authors have tabulated the length of life of the children of royal families listed in Allstrom's Dictionary of Royal Lineage having four or more children living to 21 or more years of age according to the age of the parents at the time of birth of the children and according to the birth rank of the children. The length of life of the children showed no relation to the age of the parents or to the birth rank. Other work on this subject is reviewed.

Variation in the intensity of linkage in maize, L. J. STADLER (*Amer. Nat., 59 (1925), No. 663, pp. 366–370*).—Rather wide differences in crossing-over in the *C–Wx* region between ears of the same corn plant at the University of Missouri suggest that significant differences in crossover percentage in megasporogenesis and microsporogenesis, such as those reported by Emerson

and Hutchinson,[1] may be due merely to different environmental conditions during the maturation of male and female gametes, a possibility suggested by those authors.

On the occurrence in rabbits of linkage in inheritance between albinism and brown pigmentation, W. E. Castle (*Natl. Acad. Sci. Proc., 10 (1924), No. 12, pp. 486–488*).—In experiments at the Bussey Institution, the factors for albinism and brown pigmentation have been found to be loosely linked in the rabbit. Of the 309 individuals obtained in back-crosses of parents heterozygous for color and black with double recessives, Himalayan albinos, 41 per cent were crossovers. The probable error was 1.92 per cent, the odds, indicating significance, being 650 : 1. The small size of mammalian chromosomes would not lead one to expect such loose linkage.

Biological and social consequences of race-crossing, W. E. Castle (*Jour. Heredity, 15 (1924), No. 9, pp. 362–369, fig. 1*).—The author has criticized the work of J. A. Mjøen[2] and has shown that there are no biological reasons for believing that race crosses are inferior. It is, however, stated that race crosses among human beings naturally tend to be eliminated because of social disfavor.

The sex-ratio and the question of its control, F. A. E. Crew (*Internatl. Rev. Sci. and Pract. Agr. [Rome], n. ser., 2 (1924), No. 3, pp. 554–570*).—The sex ratios in the different animals as reported by other investigators are reviewed, and the effects of season, age, litter size, parity, and other factors on sex ratios are discussed. It is concluded that sex control depends on controlling differential production of gametes by the heterogametic sex or of producing complete sex reversal.

The extraction and some properties of an ovarian hormone, E. A. Doisy, J. O. Ralls, E. Allen, and C. G. Johnston (*Jour. Biol. Chem., 61 (1924), No. 3, pp. 711–727, fig. 1*).—A modified method of extracting the ovarian harmone from the liquor folliculi is described. The fresh liquor folliculi is mixed with 2 volumes of 95 per cent alcohol, and after coagulation the proteins are filtered off and extracted with 95 per cent alcohol. The filtrate and extract are concentrated to dryness, and the dried residue is emulsified with water and sufficient alcohol added to make the total volume 15 cc. for each 100 cc. of liquor folliculi extracted. The material is heated to boiling and 2 volumes of acetone are added, followed by cooling and filtering. After several leachings in this manner, the filtrates are distilled to dryness and the residue leached from 5 to 7 times with small volumes of boiling alcohol and cooled in a salt ice mixture prior to filtration. The alcoholic solution is distilled to dryness and the residue taken up in anhydrous ether. Any precipitate is rejected. The solution is evaporated, and the residue is dissolved in purified corn oil for injection purposes.

Other methods of purification by hydrolysis with acids and bases have been partially satisfactory, but the hormone is frequently destroyed. Comparisons of the amount of the hormone in various tissues are tabulated, and it is shown that the ovaries and placenta contain it, though liquor folliculi contains the largest amounts. The properties of the purified hormone are briefly described. It is noted that it is soluble in ether, chloroform, petroleum ether, 95 per cent alcohol, and acetone, but is insoluble in water, though it forms colloidal solutions when freed from cholesterol. It is thermostable and fairly resistant to mild hydrolysis with weak acids and alkalies.

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[1] Genetics, 6 (1921), No. 5, pp. 417–432.

[2] *Harmonic and disharmonic race crossings.* In Eugenics in Race and State (Sci. Papers 2. Internatl. Cong. Eugenics). Baltimore: Williams & Wilkins Co., 1923, vol. 2, pp. 41–61.

FIELD CROPS

[Agronomic investigations in Minnesota] (*Minnesota Sta. Rpt. 1924, pt. 3, pp. 3–21, figs. 11*).—In a popular account of experimental work at the station (E. S. R., 50, p. 132) are described the characteristics of improved crop varieties including Gopher oats, a stiff strawed selection from Sixty-Day oats; Winona and Chippewa flax, wilt resistant selections; Minturki (Odessa × Turkey) wheat, excelling in winter hardiness and with considerable resistance to black stem rust; and Velvet, a smooth-awned, 6-rowed, high-yielding barley with resistance to spot blotch.

Progress in efforts to develop oats and spring wheat resistant to black stem rust and oats to smut is reported briefly, methods of corn improvement (E. S. R., 52, p. 31) are compared, and the relative merits of biennial and annual sweet clover (E. S. R., 51, p. 640) are indicated. The beneficial effects of phosphate and other fertilizers for alfalfa and clovers have been noted earlier (E. S. R., 50, p. 120). Sulfur fertilizers on alfalfa have failed to show any distinctly beneficial effect in many parts of the State, their place in Minnesota probably being limited to the northern sands and on these to alfalfa.

Experiments during three years showed that for southern Minnesota Habaro, Minsoy, Chestnut, Elton, and Manchu soy beans will do best for seed production, and, excepting Minsoy, will also be most satisfactory for hay.

Meadow and pasture management in the Ozark region of Missouri, C. A. Helm (*Missouri Sta. Bul. 234 (1925), pp. 32, figs. 21*).—Based on a survey during 1924, the characteristics and value for pasture and meadow of the several sections of the Ozark region in Missouri are described, the utilization of land and types of farming are indicated, and methods of clearing land with goats, fire, hand labor, and the sprout cutter are outlined. The merits of different grasses and legumes are discussed, with comment on mixtures and seeding practices.

[Field crops experiments in Rhode Island, 1924] (*Rhode Island Sta. Rpt. 1924, pp. 5, 6, 7, 8, 9*).—Investigations with field crops reported on in continuation of earlier work (E. S. R., 51, p. 741) included comparisons of hybrids and varieties of potatoes, timothy strains, and rye varieties; rotations; tests of grasses and legumes in mixtures; and determination of the minimum fertilizer nutrient requirement for normal growth of barley, oats, and wheat.

Dry farming in southeastern Wyoming, A. L. Nelson (*U. S. Dept. Agr. Bul. 1315 (1925), pp. 20, figs. 10*).—Rotations and cultural investigations, including cereals, carried on in cooperation with the Wyoming Experiment Station at the Archer Field Station near Cheyenne (E. S. R., 48, p. 734), are reported on for the period 1913–1923. The relation of seasonal precipitation to crop production is commented on, with discussion of rotations and crop resistance to drought, disease, and storm.

The average acre yield of spring wheat was 10.9 bu., oats 1[illegible], barley 12.6, and corn 15.9 bu. of grain and about 1,800 lbs. of stover. Spring wheat made its highest acre yield, 13.3 bu., after peas plowed under for green manure, oats 20.3 bu. on both disked and spring plowed corn ground, and barley 18.6 bu. on fallow. Spring wheat yields on fallow or disked corn ground were more profitable than with green manure. Because of losses due to winterkilling and soil blowing winter wheat is not reliable. Flax did not produce satisfactory average yields, largely because it could not compete with weeds, particularly Russian thistle. Corn proved fairly reliable for both grain and forage, and its culture seems essential to the most economical production of small grains. It did not average as high on fallow as when grown by several other methods.

Unlike small grains, continuous corn, except where listed, produced relatively good yields.

Yields of all crops were generally better on spring plowing than on fall plowing. Subsoiling did not prove advantageous or profitable. Rate of seeding experiments suggest seeding spring wheat 3 to 4 pk. per acre, winter wheat 3 pk. on fallow and from 4 to 5 pk. on stubble, oats 5 to 6 pk., barley 4 pk., and flax 15 to 25 lbs. Spring grains should not be sown later than May 15 and winter grains about September 1.

Effects of crops on the yields of succeeding crops in the rotation, with special reference to tobacco, W. W. Garner, W. M. Lunn, and D. E. Brown (*Jour. Agr. Research* [*U. S.*], *30* (*1925*), *No. 12, pp. 1095–1132, pls. 8, figs. 17*).—In field experiments made at Upper Marlboro, Md., (E. S. R., 41, p. 143), on Collington fine sandy loam soil, the results to date do not support the view that tobacco is especially injurious to the general productiveness of the soil. On the other hand, the tobacco plant appears to be particularly sensitive to the effects of preceding crops, and attempts to apply such intensive methods as turning under soil-improving crops freely or using much manure and fertilizers are likely to fail. The growth of the plant may be seriously retarded as a result of the effects of preceding crops of tobacco or of other plants. Reduced tobacco yields do not seem to involve a reduction in the general productiveness of the soil. None of the cropping systems tested have given results with tobacco equal to those obtained on rested land, i. e., land occupied for a period of years by adventitious vegetation.

Tobacco, potatoes, and corn each were grown in continuous culture, and in alternation; in rotation with wheat, oats, and rye; and in rotation with each of the three cereals, legumes, and a grass mixture, and, except where soiling crops were used, four different fertilizer treatments were used in each cropping system. Tobacco resembled potatoes rather than corn in its effects on succeeding crops. Continuous tobacco tended to decline in yield, but more recently the growth after corn was yet poorer. Potatoes gave best yields after tobacco and poorest yields after corn. Corn was not greatly affected by preceding crops, but in comparison with tobacco and potatoes, decidedly reduced the yields of succeeding crops of wheat and oats, and, to a lessed extent, rye. Legumes in the rotation intensified rather than overcame the differences in effects of tobacco, potatoes, and corn on the small grains. Grass as a soiling crop markedly redneed the yield of tobacco and potatoes and to a lesser extent the corn. Neither tobacco nor potatoes could use effectively the nitrogen of the legumes, whereas corn and the small grains were greatly benefited.

Not wholly explainable on the basis of the plant-food theory or of parasitic disease, these crop effects appear transitory as to toxicity or injuriousness and are markedly influenced by the soil character and weather and to some extent by fertilizers and lime. Preliminary field and pot tests with tobacco indicate that the injurious effects of preceding crop plants come mostly from the roots rather than the tops of these plants.

A comparison of four legumes as regards their ability to withstand winter conditions and increase the yields of the truck crops following, F. K. Crandall and B. L. Hartwell (*Jour. Amer. Soc. Agron., 17* (*1925*). *No. 6, pp. 363–367*).—Red clover, alfalfa, biennial sweet clover, and winter or hairy vetch were compared at the Rhode Island Experiment Station to determine their relative hardiness as winter cover crops and their value as green manures in growing truck crops.

Red clover was superior to alfalfa, biennial sweet clover, and winter vetch in germination and growth when seeded in late summer or early fall and also

withstood winter conditions best. The truck crops following the red clover have yielded more heavily on the average than when grown after alfalfa, winter vetch, or biennial sweet clover.

Variations within and between morphological varieties of oats and barley, R. G. Wiggans (*New York Cornell Sta. Mem. 94 (1925), pp. 3–35, figs. 4*).—The variations in yield and adaptation of varieties, as well as of strains within the variety, were studied in 10 varieties of oats and 11 varieties of barley, all morphologically different. Conclusions from this study may be summarized as follows:

The same names have been applied to varieties of oats and barley distinct morphologically and to strains significantly different in yield. As a result, a name applied to a particular sample is of little value unless the exact source and the past performance be known. Statistically significant differences in yield have demonstrated that physiological strains exist in most morphological varieties. Identification by morphological characters is often limited to groups of physiological strains. Regardless of the strain, some varieties surpass other varieties in yield. A given variety need not be condemned because of the low yields of its only representative in the test.

Barley presents a greater seasonal variation than do oats, and is therefore probably not so well adapted to New York conditions. Due to their greater variability, some varieties of oats and barley show greater possibilities in breeding work than do others. While percentage of hulls in oats appeared to be influenced more by seasonal conditions than by variety, within the same season, a very marked difference exists between strains of a given variety and between different varieties.

The effect of soil structure on the character of alfalfa root-systems, F. A. Carlson (*Jour. Amer. Soc. Agron., 17 (1925), No. 6, pp. 336–345, figs. 13*).—The effect of soil structure on the development of alfalfa root systems was studied at the New York Cornell Experiment Station, using varieties and strains grown in field plats offering different kinds of soil structure, in tanks filled with different classes of soil, and in water cultures.

In compact soil all varieties and strains developed branch roots, while in open soil the taproots predominated. Grimm alfalfa was characterized by broad deep-set crowns and numerous fibrous roots. The northern- and southern-grown common alfalfas had similar root features, small high-set crowns, and few fibrous roots. Baltic and Siberian alfalfas compared favorably with the characteristics of Grimm alfalfa. The distinctive characteristics of alfalfa roots did not appear to develop until after from three to four months of normal growth. The results of water culture experiment substantiated those obtained under field conditions.

Apparently, Grimm and common as representatives of the hardy and nonhardy alfalfas, respectively, have inherent root characteristics, and the nature of the soil structure determines the degree of root branching.

Hardy alfalfa for Nebraska, T. A. Kiesselbach and A. Anderson (*Nebraska Sta. Circ. 32 (1925), pp. 8, figs. 5*).—In seedings of 8 important alfalfa varieties and of 18 regional strains of common alfalfa, Peruvian was almost completely winterkilled, and the stands of Argentine, Italian, and Spanish were reduced an average of about 50 per cent, whereas the other sorts showed no appreciable loss in stand. American-grown common alfalfa and the variegated varieties did not differ markedly in productiveness, growth characteristics, or winter hardiness during the three years tested. Peruvian, Sand Lucern, and Turkestan yielded somewhat less than common alfalfa during comparable years and should not be seeded in Nebraska. From available data for Nebraska conditions

it would not seem justifiable to pay a large premium for seed of variegated varieties when seed of a hardy strain of common alfalfa can be had.

Experiments with varying stands and distribution of corn, L. W. Osborn (*Arkansas Sta. Bul. 200 (1925), pp. 3–36*).—The results of rates of planting, check v. drill, and wide, medium, and narrow row experiments with corn conducted since 1909 are summarized.

Under favorable soil and moisture conditions yields increased as the rate increased up to about 9,000 plants per acre, and under optimum conditions, a rate of 12,000 plants tends to outyield 9,000. With adverse conditions the varietal yield tends to decrease as the rate increases above a certain point, the rate of decrease depending upon the relation between plant growth produced and available moisture or plant food. Varieties similar in growth tend to behave similarly under uniform conditions of soil and season in any specified rates of planting. Seasonal conditions prevent a specified rate for maximum yields for the same variety in successive seasons even under uniform conditions.

Under favorable conditions the tall, late maturing Cotton Belt and Corn Belt varieties decreased most rapidly in yield as the rate per acre increased. Shorter, medium maturing Cotton Belt varieties and the shorter, earlier maturing Corn Belt varieties yielded more consistently at higher rates than did tall, late sorts.

The percentage of barren stalks, even in high rates of planting, is low under favorable conditions, while under adverse conditions the percentage is increased, particularly in the highest rates. The best ears were found in the lower rates of planting, with a gradual decrease in size as the planting rate increased, and a high percentage of nubbins in the highest rates.

The acre tonnage of fodder and of stover increased with the rate of planting under favorable conditions, while with unfavorable conditions an increase was more uncertain. The stover-ear corn ratio is largest in the late maturing varieties and becomes proportionately lower in earlier maturing sorts. This ratio is increased in all varieties with favorable conditions for growth and maturity, the increase being largest in the highest planting rates. The ratio tends to increase generally as the planting rate increases, especially when shortage of plant food or of moisture affects the grain yields in the higher rates. Under very favorable conditions, when high rates of planting do well, the ratio may not vary greatly in the different rates and may be lower in the high than in the low rates.

Corn plants under normal conditions can adjust themselves to a wide range in stand without much apparent alteration in yield. In a low rate each plant produces larger or more ears per stalk and more tillers and ears per tiller. Less growth vigor and proportionately smaller ears are noted as the plant competition increases.

In experiments comparing checked v. drilled plantings of corn very little difference in yield was indicated in favor of either practice. Any increased yield gained by drilling corn is more than offset by the increased cost of weed removal.

Corn planted in 7- to 8-ft. rows at certain rates per acre produced about two-thirds of the yields made in narrow rows. Corn in 6-ft. rows produced 76 per cent of the yield of the same acre rate in 4-ft. rows. Under favorable conditions when corn yields average between 45 and 50 bu. the wider rows will produce a higher percentage of the yield of narrow rows than under poorer conditions.

Cotton variety experiments, J. O. Ware (*Arkansas Sta. Bul. 197 (1925), pp. 3–27*).—Thirteen comprehensive cotton variety tests (E. S. R., 47, p. 731)

conducted at Scott, Burdette, Lake Village, and Homan during the period 1921–1924 included commercial varieties of importance to Arkansas in 1921, new sorts becoming prominent since 1921, and strains developed by the station. Under the test conditions, 14,000 or 15,000 plants per acre seemed to be the rate at which slight differences in plant numbers least affect yields.

Consideration of the agronomic data recorded indicated that while early varieties have a somewhat lower gin turnout and smaller bolls, they average more lint cotton per acre during a period of years. The high lint percentage of the later varieties did not make up in lint for the extra amount of seed cotton produced by the early varieties. Gin turnout alone did not appear to be a safe criterion for a variety. Earliness seems necessary for high production under boll weevil conditions. On the average, total yields are proportional to the size of the first picking. Each year the early sorts have been certain and usually produced the highest yields, while, except in 1924, big boll later varieties generally yielded less and almost failed in some instances. Long staple accompanies a lower lint percentage but as indicated by Express and Delfos, not necessarily low yield. Length and quality of lint appeared to be affected by soil and season.

A machine for treating cotton seed with sulphuric acid, J. G. Brown and F. Gibson (*Arizona Sta. Bul. 105 (1925), pp. 380–391, figs. 8*).—The machine described delints cotton seed with sulfuric acid quickly and thoroughly and with safety to the operator. The advantages of the sulfuric acid treatment included surface sterilization of the seed, quicker and higher germination, ease in handling seed during planting, and a healthier and more uniform stand. The estimated cost per acre of the treatment is about 18 to 20 cts.

Flax growing in South Dakota, A. N. Hume, E. W. Hardies, and C. Franzke (*South Dakota Sta. Bul. 213 (1925), pp. 23, figs. 8*).—The information and experimental data presented supplement those recorded earlier (E. S. R., 36, p. 635). Further tests at Highmore, Cottonwood, and Eureka indicated April 15 as the best seeding date for highest yields. A rate of not less than 20 qt. per acre is suggested.

During 2 years one acre seeded to clear flax produced a larger total yield of flax than did 2 acres seeded in mixture with wheat, while the reverse was true with wheat. The combined production from 2 acres seeded in flax-wheat mixture was greater in both years than where flax and wheat were seeded separately, each on 1 acre. Greater gross financial receipts for flax came from 1 acre of clear flax seeded along with 1 acre of clear wheat than from the flax in 2 acres of flax-wheat mixture, whereas the opposite was true of wheat. The highest gross financial return in the experiment was received from land seeded into flax-wheat mixture in 1924, and the highest average return in the 2 years came from land seeded in flax-wheat mixture.

The usual records of the annual precipitation by months at the station and substations are appended.

Hay, C. V. Piper, R. A. Oakley, H. N. Vinall, A. J. Pieters, W. J. Morse, W. J. Spillman, O. C. Stine, J. S. Cotton, G. A. Collier, M. R. Cooper, E. C. Parker, E. W. Sheets, and A. T. Semple (*U. S. Dept. Agr. Yearbook 1924, pp. 285–376, figs. 59*).—The information compiled in this article treats of the place of hay in farming, the characteristics of a good hay plant, the factors governing hay production, the factors determining the acreage on the individual farm, the history of the development of hay production, hay production and feeding values, haymaking, measuring hay in the stack, the economics of hay production, marketing hay, and the costs of producing hay.

Improved oat varieties for New York and adjacent States, H. H. Love, T. R. Stanton, and W. T. Craig (*U. S. Dept. Agr., Dept. Circ. 353 (1925)*,

pp. 15, figs. 6).—Investigations at Ithaca, N. Y., in cooperation with the New York Cornell Experiment Station (E. S. R., 52, p. 635), have developed six pure line selections of oats, Cornellian (from Canada Cluster), Ithacan (from National), Comewell (from Welcome), Empire (from Big Four), Standwell (from Lincoln), and Upright, a sort resistant to lodging (from American Beauty). Their respective average yields during six years' tests were 58.9, 53.7, 51, 50, 50, and 48.5 bu., as compared with 49.5 bu. from Silvermine, 46.4 from Swedish Select, and 39.2 bu. from Mammoth Cluster (Storm King).

On New York farms Ithacan and Cornellian have surpassed the midseason white varieties, Comewell, Empire, Standwell, Upright, and Victory, as a group by about 3 bu. to the acre. As at Ithaca, Mammoth Cluster has been markedly inferior in yield. The proportion of caryopsis to total floret (kernel), or percentage of "meat" to hull, seems to be a very important character and one well developed in the new variety Cornellian. The low percentage of caryopsis in such side oats as Mammoth Cluster does not recommend this type for growing on New York farms.

Improved oat varieties for the Corn Belt, L. C. Burnett, T. R. Stanton, and C. W. Warburton (*U. S. Dept. Agr. Bul. 1343 (1925), pp. 31, figs. 15*).—Four oats varieties (E. S. R., 53, p. 435), Albion (Iowa 103), Richland (Iowa 105), Iowar and Iogren, developed cooperatively by the Iowa Experiment Station and this Department, are described, and their behavior in tests in Iowa and in other States is reported. A résumé of the average yields of these varieties in comparison with the yields of parent and of other standard varieties in surrounding Corn Belt and States other than Iowa showed that Albion, Richland, and Iowar have been most promising in sections where the parent sorts, Kherson and Sixty-Day, have been the leading varieties. Since in such areas the selections usually slightly outyield the parent varieties, it is claimed that they may profitably be substituted where Kherson or Sixty-Day is grown. Seeding tests have recommended a 3-bu. rate per acre for Albion and Richland, over 3 bu. for Iowar, and 4 bu. for Iogren.

Report on maturity and yield trials of first early potatoes, 1923, W. H. Parker (*Jour. Natl. Inst. Agr. Bot., No. 3 (1925), pp. 3–14*).—The comparative maturity, yields, and marketability of five varieties of potatoes immune from wart disease and five susceptible varieties tested in four centers in Great Britain are described, together with brief accounts of experimental methods and varietal competition. The $\frac{1}{200}$-acre plat (2 ft. 2 in. by 100 ft. 9 in.) gave the most promise of accurate results. Lack of tangible competition between adjacent varietal rows seemed to preclude the need of a guard row between such rows.

Report of the potato synonym committee on the potatoes sent for immunity trials to the potato testing station, Ormskirk, Lancashire, 1924, R. N. Salaman et al. (*Jour. Natl. Inst. Agr. Bot., No. 3 (1925), pp. 32–38*).—Examinations of varieties of potatoes are discussed with the usual comment on incidence of wart disease.

Experiments in rice production in southwestern Louisiana, C. E. Chambliss and J. M. Jenkins (*U. S. Dept. Agr. Bul. 1356 (1925), pp. 32, figs. 9*).—The cultural, irrigation, and rotation experiments with rice described were conducted at the Rice Experiment Station, Crowley, La., in cooperation with the Louisiana Experiment Station during the period 1911–1923. Data on rice production in southwestern Louisiana, and the soils, topography, precipitation, temperature, wind velocity, and evaporation at the station are also included.

Yields obtained from the deeper (5–7 in.) plowing were greater than from the shallower (2–3 in.) plowing. An average acre increase of 477 lbs. of rice

made on a smooth seed bed showed that a rough seed bed is not suited for rice. May 14 seemed to be about the best date for sowing rice. Earlier seedings, especially on land foul with weeds, often result in a weedy crop. The largest average acre yields were obtained from acre seeding rates of 80 and 100 lbs. drilled and from seeding 1 in. deep.

Acid phosphate, ammonium sulfate, sodium nitrate, and cottonseed meal did not increase the rice yield when applied singly, nor did acid phosphate applied with other fertilizers. Dried blood may be applied to advantage when a legume is not used to supply nitrogen. Potassium sulfate at the rate of 100 lbs. per acre produced a yield increase when used alone and with ammonium sulfate. Liming tests showed that sedges are largely eradicated when lime is applied, and that the rice yield may be increased by limited applications of limestone at intervals of several years. Good drainage, good tillage, and proper crop rotation make unnecessary the application of commercial fertilizer to Crowley silt loam at present.

The best yields of rice were obtained by growing the crop in rotation with Biloxi soy beans and not by the use of fertilizers. Soy beans should be seeded in 4-ft. rows, at a rate of 30 lbs. per acre, and not before the last week in May or after June 15. The crop should be harvested after the leaves have fallen but not until the pods open readily when pressed between the fingers. Pasturing weedy fields does not control red rice, whereas the soy-bean rotation effectively controls red rice and other weeds. Thorough tillage before seeding soy beans and rice is important in weed control, although tillage alone has not been economical in controlling red rice.

Submerging the land 15 days after the rice plants emerged produced an average of 720 lbs. more rice than obtained by submerging 15 days later. Further reduction in average yield accompanied each successive later date of submergence. An 8-in. submergence probably is the greatest depth of water required for profitable rice yields, while 6 or even 4 in. may suffice on very level land where low levees are used.

Saltbushes and their allies in the United States, G. L. Bidwell and E. O. Wooton (*U. S. Dept. Agr. Bul. 1345 (1925), pp. 40, pls. 10, fig. 1*).—The general distribution in the United States of the saltbushes and related species is indicated, and the characteristics, forage value, and composition are shown for species pertaining to the goosefoot, pigweed, and buckwheat families.

The effect on nodule-formation and seed-production of growing soybeans on soil treated with sulfur dioxide, L. T. Leonard and S. H. Newcomer (*Jour. Amer. Soc. Agron., 17 (1925), No. 6, pp. 309–312*).—Treatment of field soil on Arlington Farm, Va., with sulfur dioxide and formaldehyde in 1 per cent concentrations seemed to inhibit the nodule formation on the upper parts of the roots of Peking soy beans. Sulphorm, a combination of the two chemicals, applied in the same concentration, did not inhibit nodule formation to a like extent. No beneficial effects were noticeable in the crops from any of the plats, except that the plat treated with Sulphorm gave about 20 per cent more seed than the average of three controls.

Variety and rotation experiments with soy beans, C. K. McClelland (*Arkansas Sta. Bul. 199 (1925), pp. 3–21, figs. 4*).—The seed and hay yields of numerous varieties of soy beans are recorded from comparative tests at the station during the period 1908–1924.

Comparison of tabulated climatic data with yields showed that the yields of soy beans were evidently correlated with the rainfall of August and also with the rainfall for June, July, and August. May 10 seemed about the best average date for planting.

In soil improvement studies, better than 45 per cent more corn was obtained after soy beans and cowpeas were turned under than after oats. Soy-bean stubble was less valuable than cowpea stubble, but there was no difference when full crops were turned under.

Low yields were made on the light sandy soils at Magnolia, and much greater yields were had with the same varieties on the heavier soils of central and eastern Arkansas than at either Fayetteville or Magnolia.

Some notes on cane variety work in Tucumán, Argentina, W. E. Cross (*Internatl. Sugar Jour., 27 (1925), No. 316, pp. 199–204*).—A review of varietal studies with sugar cane in Tucumán.

Colorado pure seed law (*Colorado Sta. Bul. 300 (1925), pp. 8*).—This comprises the text of the Colorado pure seed law, approved April 24, 1925, with a brief summary of the principal provisions.

Some new weeds of Iowa, L. H. Pammel and C. M. King (*Iowa Sta. Circ. 98 (1925), pp. 16, figs. 17*).—Weeds described as new in Iowa, with control methods, include hoary alyssum (*Berteroa incana*), perfoliate-leaved peppergrass (*Lepidium perfoliatum*), hoary cress (*L. draba*), caper spurge (*Euphorbia lathyrus*), gaura (*Gaura biennis*), wild blue morning-glory (*Ipomoea hederacea*), viper's bugloss or blueweed (*Echium vulgare*), tarweed or gumweed (*Grindelia squarrosa*), galinsoga (*Galinsoga parviflora*), plumeless thistle or musk thistle (*Carduus nutans*), smaller plumeless thistle (*C. acanthoides*), uncut-leaved Canada thistle (*Cirsium arvense integrifolium*), Barnaby's thistle (*Centaurea solstitialis*), knapweed (*C. jacea, C. maculosa*), bristly oxtongue (*Picris echioides*), and perennial sow thistle (*Sonchus arvensis*).

HORTICULTURE

[Horticultural investigations at the Minnesota Station] (*Minnesota Sta. Rpt. 1924, pt. 3, pp. 25, 26, 28a, 28b, 29, 30, fig. 1*).—Tests of commercial and seedling strawberries show Minnehaha, Nokomis, and Easy Picker to be the best plant makers. In point of yield, Easy Picker was best, and Chaska, Minnehaha, and Dunlap gave satisfactory results. Premier and Campbell Early were the earliest of the June fruiting varieties, and Minnehaha, though not the latest to mature, was the most satisfactory late variety both in respect to yield and to shipping qualities. Premier and Minnehaha possessed the firmest texture. In surface color, Chaska, Collins, Dunlap, Eaton, Minnehaha, Premier, and Parson Beauty were superior. In flesh color Chaska and Easy Picker led, with Dunlap and Mascot nearly as good. Based on general performance, Premier, Dunlap, Chaska, Easy Picker, and Minnehaha, arranged in approximate ripening order, are considered the best for commercial purposes. The varieties of the everbearing group, though inferior to the June bearers in yield, have merit in earlier June fruiting and in yielding an autumn crop. Of this group, Progressive and Duluth were found the most satisfactory.

To avoid winter root injury to apple trees, Minnesota nurserymen are using the hardy home-grown seedlings as stocks in preference to French crabs. Observations upon trees of Oldenburg (Duchess), Wealthy, McIntosh, and Jonathan, all worked on French crab stocks and obtained in 1916 from nurseries in Minnesota, Missouri, Alabama, Oregon, New York, and Maryland, in order to test the effect of the point of origin on hardiness, failed to show any significant differences due to the source of the trees. All the Jonathan trees died or were disastrously winter injured. Similar records on a block of Oldenburg trees obtained in 1920 from Maryland, Minnesota, and Missouri yielded similar information, the variations among trees from one source being as marked as those among trees from various sources. No differences ascribable

to source were noted in the first fruits produced by the trees. However, the trees from Missouri suffered the greatest mortality because of their French crab roots.

In testing a large number of new vegetables, Golden Acre cabbage, Mary Washington asparagus, Ebenezer onion, Kitchenette Hubbard and Des Moines squashes, Thomas Hybrid muskmelon, and Burbank tomato were found to possess considerable merit.

[Horticultural investigations at the Rhode Island Station] (*Rhode Island Sta. Rpt. 1924, pp. 6, 7, 8*).—Contrary to results given in the preceding report (E. S. R., 51, p. 746), the Savoy-leafed spinach outyielded the Giant Thickleaf variety. A comparison of Copenhagen and Charleston Wakefield cabbages for early planting was to the advantage of the former variety both in the total yield and in the weight of heads. In fertilizer studies with asparagus, even where like soil acidity (pH 5.8) was maintained, full application of sodium chloride increased the crop when used with an insufficient amount of potassium, whereas sodium carbonate did not. With smaller applications, potassium carbonate was less useful than the chloride. The full and three-fourths rations of sodium carbonate killed chickweed but had little effect on purslane, while sodium chloride had no apparent effect on either weed.

In a comparison of home-grown Hubbard squash with strain 270 of the Vermont Experiment Station, the total yields were approximately equal, but the Vermont squashes averaged only 3.1 lbs. as compared with 5.5 lbs. for the home-grown strain. A trial in the greenhouse of various salad and flavoring plants, including cress, white and Chinese mustards, beets, chives, chard, etc., showed the white mustard and curled cress to be the most valuable. In greenhouse tests the John Baer tomato bore the largest and most fruits. Bonny Best and Comet varieties were quite comparable.

Vegetable planting outlines for Arizona, M. F. Wharton (*Arizona Sta. Timely Hints for Farmers, No. 151 (1925), pp. 14*).—Tabulated data are presented on the date of planting, depth of seeding, amount of seed or plants required per given area, varieties, dates of ripening, etc., for vegetables in various parts of the State.

The growing and handling of head lettuce in California, H. A. Jones and E. L. Garthwaite (*California Sta. Circ. 295 (1925), pp. 36, figs. 32*).—Herein is presented general information concerning the present status of the lettuce-growing industry in California, pointing out the climatic and soil requirements of the plant, methods of improving and preparing the soil, planting, irrigation, culture, harvesting, marketing, and the combating of various pests.

Grafting, budding, and early care of fruit trees, T. J. Talbert (*Missouri Sta. Bul. 233 (1925), pp. 36, figs. 20*).—In addition to a comprehensive discussion of the principles and practices involved in the propagation of fruit trees by budding and grafting, the author reports the results of a long-continued study of the relative value of whole and piece root Jonathan apple trees grafted in the winter of 1899. Records taken on the trees during the years 1912–1919 showed no material differences in growth or yield that could be attributed to the original size or condition of the rootstock. No appreciable differences were noted in the character or quality of the fruits from the various trees. The author believes that the grower should pay more attention to the size and vigor of the young nursery tree and less to the size and source of the original root.

Effect of debudding in the formation of scaffold branches upon leaf surface and terminal growth, F. N. Fagan (*Amer. Soc. Hort. Sci. Proc., 21

(1924), pp. 12, 13, fig. 1).—Leaf counts and growth measurements taken in a comparison of pruning and disbudding as means of shaping newly set fruit trees led the author to conclude that disbudding is the better practice, offering, among other advantages, a better choice and distribution of scaffold limbs.

An improved type of pressure tester for the determination of fruit maturity, J. R. MAGNESS and G. F. TAYLOR (*U. S. Dept. Agr., Dept. Circ. 350 (1925), pp. 8, figs. 3*).—Herein is briefly described an improved type (E. S. R., 46, p. 641) of testing apparatus for determining the maturity of apples by recording the number of pounds of pressure required to force a blunt plunger into the flesh of the fruit.

In tests upon peeled and unpeeled surfaces, it was found that the skin of certain varieties was much more resistant than that of others, and that accurate comparisons were obtained only with peeled fruit. Slight differences were noted according to the rate of application of the pressure test, the higher readings being obtained with more rapid operations. Tabulated data are presented upon the approximate range of pressures of important commercial apple varieties, both at the time of picking and at the time of full maturity, all tests being conducted with peeled fruit.

The **fruits of France**, H. LECLERC (*Les Fruits de France. Paris: Masson & Co., 1925, pp. 274*).—In a popular manner, the author discusses the history, chemical composition, and food and therapeutic values of fruits commonly grown in France.

Harvesting, grading, packing, and loading apples, with some attention to peaches and pears, G. W. PECK (*N. Y. Agr. Col. (Cornell) Ext. Bul. 126 (1925), pp. 45, figs. 28*).—Amply illustrated, this pamphlet contains general information of value to the practical grower.

Cold storage investigations with Wealthy apples, H. H. PLAGGE and T. J. MANEY (*Iowa Sta. Bul. 230 (1925), pp. 57–72, figs. 10*).—In this, the fifth progress report upon apple storage investigations (E. S. R., 52, p. 651), the authors discuss work with Wealthy apples harvested August 27 and September 4 and 11, 1923, dates representing immature, mature, and overripe conditions.

Apple scald occurred only on apples of the first harvest and was practically all confined to fruits stored within one day of picking. The beneficial effect of oiled papers in decreasing the amount of scald injury was indicated in a count of 5 per cent of scald on wrapped and 33.5 per cent on unwrapped fruits of the August 27 harvest. A delay in placing fruit in cold storage greatly increased the amount of soft scald, especially in the August 27 lot. Immediate storage reduced the amount of soft scald for all three pickings. Inconsistent results in the control of soft scald were obtained from the use of oiled wraps.

Observations upon the fruits of all three harvests taken from cold storage on November 1 and placed partly in a temperature of 70° F. with low humidity and partly in a temperature of 50° with relatively high humidity showed, after 40 days, severe shriveling but no development of scald. The fruit kept in good commercial condition for 10 days in the 70° room and 15 days in the 50° room. Only slight differences were noted at this time in the keeping quality of the fruit of the three harvests. Oiled wraps slightly reduced the amount of shriveling, and poorly colored fruits were observed to shrivel more than well-colored specimens.

In concluding, the authors stress the importance of careful handling, it being found that practically all the decay centered about points of skin injury. Mechanical injuries were found to be a more frequent cause of decay than were growth cracks.

The rate of growth and the system of branch formation developed by peach trees in the nursery and the effect of summer pruning upon same, M. A. BLAKE (*Amer. Soc. Hort. Sci. Proc., 21 (1924), pp. 14–20*).—Records taken at the New Jersey Experiment Stations upon the growth of peach trees the season following budding showed that such trees usually make a large percentage of their growth before July 1. Buds which failed to develop early in the spring never equaled those that made a quick start. Trees standing by themselves tended to develop well-formed heads. On the other hand, where the light was cut off from one side an unevenly balanced tree was the result. Under similar light conditions, smaller and poorer grades of trees were observed to have fewer and less vigorous branches than large trees. Under similar environments there was an apparent relation between the height of the tree and general vigor.

Records taken on Wilma trees in 1924 showed no side branches developing on trees whose main stem was elongating at the rate of 0.2 in. or less per day. In general, the greatest number of side branches were formed on trees whose growth exceeded 0.8 in. daily. Observations indicated that the branch pattern of young peach trees may be easily modified by removing side shoots, there being a distinct tendency for trees to form branches directly above the point of removal. Up to 18 in. the removal of side shoots did not materially affect the rate of growth of the main stem. Up to 24 in. side shoot removal stimulated the rate of growth of the main stem from June 25 to July 12. The removal of side shoots up to 40 in. tended to increase the rate of growth of the main stem from June 25 to July 26. The removal of all side limbs increased the growth rate of the main stem from June 25 to the end of the season. One tree from which all the side shoots were removed attained a height of 89 in. in a single season. The leaves of such trees were larger and darker green in color. In the case of trees budded at 12 in. above the ground there was observed an unusual development of side branches directly above the union.

Strawberry growing in Kansas, R. J. BARNETT (*Kansas Sta. Circ. 116 (1925), pp. 16, figs. 6*).—General information is offered concerning varieties, soils, propagation, culture, insect and disease pests, harvesting, etc.

Effect of a rye crop on the growth of grapes, M. H. CUBBON (*Jour. Amer. Soc. Agron., 17 (1925), No. 9, pp. 568–577, fig. 1*).—Working at Cornell University with 1-year-old grapevines planted in a greenhouse during the last week of November in a heavily manured soil, the author found that the growing of a rye cover crop was distinctly deleterious to the plants, notwithstanding the fact that analyses showed an ample supply of moisture and of nitrate nitrogen beneath the rye cover. The injurious effect of the rye was apparently limited to the close of its growing season, indicating to the author the presence of some growth-inhibiting chemical substance which is apparently given off at the time the rye approaches maturity.

Some effects of seasonal conditions upon the chemical composition of American grape juices, J. S. CALDWELL (*Jour. Agr. Research [U. S.], 30 (1925), No. 12, pp. 1133–1176, figs. 13*).—Studies continued over a period of five years, 1919–1923, upon the chemical composition of the juice of 66 varieties of American grapes, grown together under known and controlled conditions at Vineland, N. J., indicated that the amount of sunshine during the period of growth is the dominant factor in determining the chemical character of the fruit. With vines maintained so as to produce normal crops annually, the year having the maximum sunshine during the period March to September was the year of maximum or next-to-maximum sugar content of the juice in a majority of the varieties studied. At the same time, the year of maximum

sunshine was the year of minimum acid and total astringent content in the majority of the varieties. Conditions which favored a maximum accumulation of sugars also favored the reduction of titratable acidity and astringent content. The range of variation in the composition of the juice of a single variety grown under constant conditions in one locality over a period of years was found to be much narrower than the variations encountered in a comparison of a large number of samples of a single variety grown over a wide area and under a variety of cultural conditions.

During the course of the investigation cane sugar was found at some time in the juice of all the varieties studied except Gaertner. The presence of cane sugar could not be definitely correlated with such factors as temperature, insolation, water supply, or size of the crop borne by the vine. There was found, however, a very clearly defined effect of climatic conditions during the growing season upon total sugar content, total astringency, and titratable acidity. All varieties responded to seasonal influences in much the same manner. In general conclusion, the author suggests the possibility of forecasting the chemical character of a grape crop where climatic factors vary within a relatively narrow range, such as obtains at Vineland.

Revival of olive growing on Majorca, I. AGUILÓ (*La Renovación Cultural del Olivo en Mallorca. Tortosa, Spain: Sanchis y Rovira, 1925, pp. 53, pl. 1, figs. 18*).—A brief discussion of the renewal of olive plantations by pruning, the use of nitrogenous fertilizers, and improved cultural practices, and of methods of extracting oil from the fruit, etc.

The comparative growth of pineapple plants with ammonia and nitrate nitrogen, G. R. STEWART, E. C. THOMAS, and J. HORNER (*Soil Sci., 20 (1925), No. 3, pp. 227–241, pls. 2*).—Studies at the Hawaiian Sugar Planters' Experiment Station upon pineapple plants growing in different strength nitrate and ammonia nutrient solutions showed significant weight differences between plants grown in the normal nitrate solution and those in any of the other series. Decidedly the best growth was obtained in the normal nitrate series, with the next best in the dilute ammonia group. Four of the six plants in the dilute nitrate series succumbed during the experiment to typical pineapple wilt. The poorest growth was made by plants grown in the normal ammonia solution, the root growth being restricted greatly in total length and in the development of root hairs.

Analyses of the nutrient solutions in which plants had grown during the latter half of the experiment showed that potassium was absorbed in the largest amount, calcium, nitrogen, and phosphorus being next in order, with magnesium used in the smallest amount. The absorption from the various cultures corresponded closely with the growth of the plants. Analyses of the plants confirmed the fact that potash was stored in the largest amount. The only significant difference in the composition of the plants grown in the nitrate and ammonia cultures was a lower content of lime in the plants receiving ammonia and a low percentage of carbon dioxide in their ash.

Cold storage behavior of avocados, E. L. OVERHOLSER (*Calif. Avocado Assoc. Ann. Rpt. 1924–1925, pp. 32–40*).—Studies conducted at the California Experiment Station indicated that 32° F. is in general too low a temperature for storing avocados, since at this temperature the skin tended to take on a scalded appearance, the flesh turned dark, and the fruit failed, upon removal from storage, to attain satisfactory maturity. On the other hand, 40° proved to be satisfactory for all varieties tested except the Fuerte, which required 45° to prevent blackening of the skin. It was found that quick storage after harvesting and care in handling aided in keeping the fruits in satisfactory

condition. Fruits picked just before the commencement of softening kept best and attained excellent quality. In proper storage, the Dickinson, Royal, Taft, and Queen varieties kept for approximately 2 months; Spinks, Sharpless, and Challenge for from 5 to 6 weeks; and Rey, Fuerte, and Kist for about 4 weeks.

Determinations of the freezing points showed 28.86° to be the critical temperature for fairly mature avocados shortly after harvesting. Frozen avocados had an excellent flavor, but upon thawing the flesh became black and the flavor unsatisfactory.

Cherimoya investigations, O. I. CLARK (*Calif. Avocado Assoc. Ann. Rpt. 1924–1925, pp. 14–17, pls. 2*).—Studies at Point Loma, Calif., indicate that the cherimoya is capable of great improvement by propagating and disseminating selected strains. The tree showed marked resistance to nematodes, thriving vigorously in a badly infested soil. Careful study of the flower structure and behavior in several varieties showed that self-pollination is the ordinary method of fertilization. No pollen-bearing insects were ever seen to visit the flowers, and the morphological structure of the flower itself was found to be adapted to self-pollination, an abundant supply of pollen being released directly upon the stigmas. It is thought that failure to secure satisfactory pollinations must result from unfavorable weather or from a lack of irrigation water during the blooming period.

Tea manurial experiments at the experiment station, Peradeniya, T. H. HOLLAND (*Trop. Agr. [Ceylon], 65 (1925), No. 1, pp. 3–9*).—Records taken on plats of tea manured in such a manner as to determine the relative value of the principal nutrients and of cover crops showed that nitrogen in every case had a beneficial effect on the bushes and in one instance effected a profitable increase in yield. Plats interplanted with leguminous trees locally known as dadaps were maintained in a thrifty condition by simply spreading the loppings from the trees in the tea rows as a supplement to a small application of basic slag and sulfate of potassium. The results of the investigation indicate that the inclusion of potassium in the fertilizer formula has had no beneficial effects, while phosphorus had some influence on growth.

Practical violet culture, N. COON (*New York: A. T. De La Mare Co., Inc., 1925, pp. 127, figs. 34*).—General information concerning indoor violet growing, discussing types of houses and frames required, varieties, propagation, management of the house, control of disease and insect pests, etc.

FORESTRY

[Forestry investigations at the Minnesota Station] (*Minnesota Sta. Rpt. 1924, pt. 3, pp. 32–35, fig. 1*).—Demonstration windbreaks planted in 54 counties indicated that these valuable protective agencies can be established anywhere in the State. Of the hardwoods utilized, the white elm, green ash, Russian olive, caragana, and box elder were most satisfactory. Of the evergreens, the white spruce was found best. Cultivation proved necessary to the successful establishment of plantations, especially of conifers. In 250 windbreaks, which were given only reasonable care, 99 per cent of the hardwoods and 83 per cent of the conifers survived.

Surveys in the cut-over land of Lake County showed only 1 per cent of such land to be altogether barren. However, on approximately half of the land the stands were not sufficient to insure adequate reforestation. The disastrous effect of forest fires was particularly noticeable on coniferous reproduction.

Observations on plantations of jack and Norway pine at the Cloquet Forest Experiment Station showed the highest rate of growth and of survival in

2-2 stock, i. e., two years in the seed bed and two years in the transplant bed. Other plats showed that white and Norway pines may be expected to survive, but not thrive, for at least 10 years under dense stands of jack pine. Such trees are deemed better able, upon the clear cutting of the jack pine. to occupy the land than young jack pines. On one stand of jack pine underplanted in 1913 with white pines, 90 per cent of the white pines survived until 1924, the date on which the jack pines were cut. Selection cuttings in a mixed stand of Norway pine, jack pine, and hardwoods yielded a satisfactory profit and at the same time improved the tract for future cuttings.

A study of forest fires, F. MICHOTTE (*Étude sur les Incendies de Forêts. Paris: Inst. Sci. Feu, 1925, pp. 64, fig. 1*).—After briefly reviewing the methods for combating forest fires utilized in various parts of the world, the author outlines systems of protection which have been found successful in French forests.

Fire and the forest (California pine region), S. B. SHOW and E. I. KOTOK (*U. S. Dept. Agr., Dept. Circ. 358 (1925), pp. 20, figs. 10*).—Observations in the California pine forests showed that fire injury is cumulative, since scars of earlier fires serve as susceptible points of attack. Direct heat killing was noted to be most frequent in forests previously injured by fire. Species varied much in their resistance to direct heat, the yellow pine being most resistant, followed in order by the sugar pine, white fir, and incense cedar. Fire scars apparently facilitate the entrance of insects and fungi. Reproduction suffered severely, as the young coniferous seedlings were easily killed.

The ultimate result of repeated burnings is nonproductive brush land, susceptible to erosion and of little value in the retention of moisture. As indicated in an earlier bulletin (E. S. R., 52, p. 542), even the very lightest of surface fires are a distinct menace to the forest, despite popular notions to the contrary. The exclusion of fire would tend to encourage reproduction greatly.

Natural reproduction after forest fires in northern Idaho, J. A. LARSEN (*Jour. Agr. Research [U. S.], 30 (1925), No. 12, pp. 1177–1197, pls. 4, figs. 3*).—Observations upon the natural restocking of singly and doubly burned areas in northern Idaho and studies of the various factors concerned in the quantity and quality of reproduction following fires indicate that the occurrence of a single fire destroying the mature forest is usually followed by a prompt and adequate restocking, made up of a goodly proportion of western white pine. However, when a second fire occurred before the young growth had reached a seed-bearing age, the chances for restocking were much reduced. For example, on an area burned in 1910 and again in 1919, there were found only one or two new seedlings per acre even on the better protected sites.

Observations upon the age of western white pine seedlings on areas burned over in 1910 showed that very little germination occurs in the first two years, and that the greatest regeneration takes place in the fourth, fifth, and sixth years subsequent to the fire. It is thought that restocking probably occurs from seeds buried in the duff by rodents previous to the fire.

In concluding, the author suggests that in northern Idaho a single fire in trees of seed-bearing age need offer no serious concern as regards restocking, but that double burns necessitate replanting, especially on southern and western slopes, which deteriorate rapidly in quality from erosion, etc. Because of their greater heat, fires on logged land are much more injurious to the forest floor than fires in virgin timber, and for this reason the author suggests the inadvisability of directly applying data obtained in this study to cutting practice.

Growing and planting coniferous trees on the farm, C. R. TILLOTSON (*U. S. Dept. Agr., Farmers' Bul. 1453 (1925), pp. II+38, figs. 28*).—General

information is presented on the collection, extraction, storing, and planting of seeds; care of plantations; selection of species for different localities, purposes, and sites; rate of growth, yields, suitable mixtures, etc.

Eucalyptus in the plains of northwest India, R. N. PARKER (*[Indian] Forest Bul. 61 (1925), pp. [3]+34*).—Following a brief résumé of the history of Eucalyptus species in northern India, the author reports upon the results of extended tests, indicating those species found useful for various sites, and discussing the silvicultural requirements of the genus. Appended are brief notes on the rates of growth and characteristics of a large number of species.

The Douglas fir in the Netherlands [trans. title], J. DE HOOGH (*Meded. Rijksboschbouwproefsta. Wageningen, 2 (1924), No. 1, pp. 7–114, pls. 10, figs. 7*).—Records taken in 29 Douglas fir plantations, ranging in age from 19 to 67 years, showed this species to be one of the most satisfactory of the exotic conifers introduced into the Netherlands. Growth was rapid and the yield of timber very large, being in some cases double that of first-class Scotch pine. Determinations of the percentage of heartwood in 24-year-old trees showed a range from 20.3 to 39.1. The trees require protection from the sweeping winds and, in addition, it was found necessary to remove side limbs in order to secure straight clean timber. Douglas fir is deemed particularly satisfactory in that, because of the abundant decomposing bed of needles, the soil was maintained in good condition. Natural regeneration was not infrequent, proving the ability of this species to adapt itself to the Netherlands environment.

Pinus insignis Doug. (Pinus radiata D. Don) in South Africa, with special reference to its growth at Tokai plantation, Cape Province, I, II, N. L. KING (*Union So. Africa Dept. Agr. Jour., 11 (1925), Nos. 1, pp. 71–86, figs. 8; 3, pp. 220–232*).—General information is presented concerning the origin, introduction into the Southern Hemisphere, and silvicultural requirements of this very rapid growing and valuable California tree, the Monterey pine (*P. radiata*). Observations in various plantations in South Africa indicated that 130 trees per acre at 25 years of age is a satisfactory stand. In favorable environments the trees attain a size suitable for supplying box wood at about 20 years of age and for structural timber at approximately 40 years. It was found necessary to prune away the dead side limbs in order to insure knot-free lumber. Tabulated data are presented upon the approximate yield per acre, cost of production, and economic returns.

The influence of soil mulches upon the growth of Scotch pines planted in drift sand [trans. title], E. HESSELINK and J. HUDIG (*Meded. Rijksboschbouwproefsta. Wageningen, 2 (1925), No. 2, pp. 125–184, pls. 6, figs. 2*).—Noting the beneficial effects, upon trees growing in drift sand, of mulches applied simply to prevent blowing, certain experiments were instituted at the Wageningen Forestry Research Station, Netherlands, for the purpose of studying the effects of various mulching and watering treatments. In the first experiment 18 iron box lysimeters, approximately 5 ft. square and 3 ft. deep and mounted on wheels to provide for weighing and movement, were carefully filled with selected low-quality sand and mulched with various materials, including loam, lupine straw, heather, and washed gravel. In each box were planted nine Scotch pines. After three seasons, marked growth differences in response to the several treatments were recorded, the trees in the control and graveled boxes making a decidedly unsatisfactory growth as compared with those in the lupine, straw, and heather treatments. Little difference was noted whether the lupine straw was applied as a mulch or incorporated in the upper strata of the soil. So unsatisfactory was the growth of the trees in the graveled

boxes that leaf mold was buried beneath five of the nine trees, this treatment yielding satisfactory results. Measurements of the annual growth of trees covered part of the year with glass frames and of similar unprotected trees showed no beneficial differences due to the glass.

Records showed that the mulches affected the soil temperature to a depth of 20 cm. (8 in.). Reckoned on the basis of 10-day averages, the temperature beneath the gravel was uniformly higher than under the lupine straw. Rains affected soil temperature according to their own temperature. Having noted significant increases in the weight of various boxes, especially the graveled ones, during periods of drought, the authors ascribe this condition to the condensation of water vapor in the upper strata.

During rainy periods from 38 to 88 per cent of the rainfall was collected as seepage water. Seepage was less in the lupine-straw boxes than in the control or graveled boxes. Observations made during a dry week in August showed the highest soil evaporation from the unmulched boxes. In correlating growth with water and temperature conditions, the authors conclude that temperature variations in the upper soil strata are not significant in drift sand plantings, and that there may be large differences in the amount of seepage water without affecting the growth of Scotch pines.

Data taken in another experiment indicated that a gravel layer without the addition of humus does not benefit the growth of trees. However, in the presence of a small amount of straw, the gravel apparently assisted in preventing evaporation and in collecting moisture through condensation from the air. The beneficial effects of gravel were noted sooner than those of the other treatments. Measurements of the second season's growth showed 5 ± 0.67 cm. average for the graveled plats and 3.1 ± 0.32 for all other treatments. All mulching treatments excepting coal dust resulted in better growth than the controls.

In still another experiment a slight watering during the dry period exerted a beneficial effect on the length of growth, especially in plants mulched with heather.

Rubber manurial experiments at the experiment station, Peradeniya, T. H. Holland (*Trop. Agr. [Ceylon], 65 (1925), No. 1, pp. 10–16, figs. 2*).—A study of records taken on the yield and growth of rubber trees submitted to various fertilizer treatments since 1913 showed the greatest growth increase in the unmanured area, although this ranks fourth in total yield. The assumption that variations in yield were due to the presence or absence of naturally high-yielding individual trees was borne out by the fact that a reversal of manurial treatments for high- and low-yielding areas failed in the first year to effect any change in the relative yields. The foliage of the plats supplied with nitrogen was apparently greener and more luxuriant than that of the control or the excess potassium plats.

DISEASES OF PLANTS

Plant disease fungi, F. L. Stevens (*New York: The Macmillan Co., 1925, pp. V+469, figs. 407*).—The author's aim in this book is to present the more important facts concerning the morphology and taxonomy of the fungus parasites that affect plants of importance in the United States. He also gives the more significant facts relating to pathological histology. Technical descriptions are given for most of the orders, genera, and species, and keys, abridged from a previous work of the author (E. S. R., 30, p. 347), are presented for the convenience of the student in identifying the various parasitic organisms treated in the work.

As in his earlier book, the arrangement is by orders beginning with the Myxomycetes through the Schizomycetes and the Eumycetes. Numerous citations to recent literature are given, the references supplementing those given in his earlier publications.

Researches on fungi.—II, Further investigations upon the production and liberation of spores in Hymenomycetes. III, The production and liberation of spores in Hymenomycetes and Uredineae, A. H. R. BULLER (*London and New York: Longmans, Green & Co., 1922, vol. 2, pp. XII+492, figs. 157; 1924, vol. 3, pp. XII+611, figs. 227*).—To the book bearing this name, as previously noted (E. S. R., 22, p. 542), have now been added two others. These develop aspects of the same general subject and of related topics, and they are numbered consecutively as volumes so as to form a series. A fourth volume of the series is in preparation.

Bordeaux Station for Plant Pathology [trans. title], P. MARCHAL (*Min. Agr. [France], Ann. Épiphyties, 9 (1923), No. 3, pp. 206–208*).—The technical information herein contained was supplied by Gard and was submitted to examination by Foex. The report deals mainly with walnut tree diseases, potato degenerescence, and a disease of maritime pine due to *Armillaria mellea*, which is said also to cause a walnut root rot.

Grignon Station for Plant Pathology [trans. title], P. MARCHAL (*Min. Agr. [France], Ann. Épiphyties, 9 (1923), No. 3, pp. 204, 205*).—Embodying technical information credited to Ducomet, the author outlines conclusions regarding potato streak and verticilliose, leaf roll, frisolée (frequently identified with mosaic), filosity, Oidium (related to *Erysiphe cichoriacearum*), and verrucosis. The selection tests begun in 1921 have shown clearly that individual selection is the most effectual means of combating transmissible diseases of the potato.

Report on work of the Station for Plant Pathology of Paris, 1922 [trans. title], P. MARCHAL (*Min. Agr. [France], Ann. Épiphyties, 9 (1923), Nos. 2, pp. 134, 135; 3, pp. 202, 203*).—These two portions of this report, one on chestnut tree diseases and one on fruit tree diseases in the Rhone Valley, together with the first, previously noted (E. S. R., 50, p. 345), complete this series for the year 1922. The technical features of the three parts are credited to E. Foex.

The dusting of wheat and oats for smut, F. D. HEALD, G. L. ZUNDEL, and L. W. BOYLE (*Phytopathology, 13 (1923), No. 4, pp. 169–183, fig. 1*).—According to results of experimentation here detailed, copper carbonate dust embodies more nearly than any other fungicide the qualities requisite to use as a protective treatment against wheat and oat smut. No reduction in germination was found to follow the use of this germicide, either immediately or after storage for as long a period as 9 months. In fact the treatment was followed by improved percentage of germination, better stands, and more vigorous growth, and while inconclusive on this point, the field data indicate less winter injury and increased yields. Seeding in the dry soil is absolutely safe so far as seed injury from copper carbonate is concerned, though data are lacking on the effectiveness of this fungicide under different conditions of soil moisture. Some results would indicate its greater effectiveness in dry soils.

Copper carbonate has been effective in preventing smut from seed-borne spores as shown by spring seedings, 2 oz. per bushel of seed giving a smut-free crop in experiments in 1921, and 3 oz. per bushel affording perfect protection in 1922, this being true in case of light, medium, and heavy smutting. In the prevention of smut from fall seedings on summer fallow, the results

have not been fully decisive. Corona compound of copper carbonate (17 to 18 per cent metallic copper) equaled pure copper carbonate, the much cheaper mixture of anhydrous copper sulfate and calcium carbonate being almost equally good. Perfect distribution over the seed is emphasized as a requirement.

In the treatment of oats for smut (*Ustilago levis*) formaldehyde gave better results than copper carbonate as the average of five farm demonstrations. In local experiments copper carbonate gave perfect control in Chinese Hull-less, but inferior protection in Swedish Select and Abundance.

Abstract of five-year co-operative experiments in the prevention of oat smut, J. E. Howitt and R. E. Stone (*Abs. in Phytopathology, 13 (1923), No. 6, p. 292*).—In experimentation to ascertain the effectiveness of the dry formaldehyde treatment in preventing oat smut, dealing with 3,002 bu. of oats in 43 trials, it was found as a result of tests extending over 5 years that the average amount of smut in crops from treated seed was 0.6 per cent and from untreated seed 3.7 per cent, the average germination, 97.5 per cent, being the same for both.

Copper carbonate dust and copper sulfate dust did not prove satisfactory in 1922 on hulled oat varieties. Copper carbonate dust gave good control of oat smut with Liberty hull-less oats without impairing germinability. Dry formaldehyde treatment, so-called, proved to be 100 per cent efficient in 1922 under plat conditions.

Experiments with hot water, formaldehyde, copper carbonate, and Chlorophol for the control of barley smuts, W. H. Tisdale, J. W. Taylor, and M. A. Griffiths (*Phytopathology, 13 (1923), No. 4, pp. 153–160*).—This paper discusses the results from seed treatments for control of the barley smuts *Ustilago nuda* and *U. hordei*, special consideration being given to the formaldehyde and the modified hot water treatments.

Formaldehyde controlled loose smut better than covered smut of barley. Hot water controlled loose smut about as well as did formaldehyde, and it controlled covered smut slightly better. However, on the average nothing was gained by either treatment, since both caused a counterbalancing seed injury. There is a varietal difference in the reaction of barleys toward these seed treatments, which may be recommended for smut control in Tennessee Winter, but not for use with Greece and Wisconsin Winter barleys. The efficiency of these treatments may vary with conditions, and where the percentages of smut are not high they would not be justified. The formaldehyde treatment is as efficient as hot water, and much more easily applied.

In a one-year trial, copper carbonate dust failed to control barley smuts, apparently increasing loose smut. It had, however, a favorable effect on seed germination. Chlorophol reduced loose smut, controlled covered smut effectively, and increased field germination, field stands, and yields of Han River and Tennessee Winter barleys in a one-year treatment.

The hot water treatment of cabbage seed, J. C. Walker (*Phytopathology, 13 (1923), No. 5, pp. 251–253*).—The procedure outlined in a previous paper (E. S. R., 47, p. 149) for disinfection of cabbage seed against *Phoma lingam* has been continued in order to determine the most satisfactory method for complete disinfection of the seed. Dry heat and formaldehyde being inapplicable, further tests with mercuric chloride and hot water were continued, soon resulting in the elimination of the former.

With hot water (50° C.) almost complete disinfection was attained in 15 minutes and complete disinfection in 30 minutes of exposure. Increase to 55° did not shorten the time necessary to complete disinfection, but in supple-

mentary field tests the longer hot water treatment (50° for 30 minutes) yielded practically perfect control. As regards reduction in germination, this was more marked after the 30-minute than after the 15-minute exposure, and more pronounced in the older seed. Retardation was noticeable in treated lots, increasing roughly with age of seed. The hot-water treatment (50° for 30 minutes) has been found satisfactory for two years with lots of seeds ranging from a few ounces to several pounds. The variability as regards injury sustained by seed lots picked at random preclude this treatment for general use.

A wound parasite of cotton bolls, H. R. Briton-Jones (*Egypt Min. Agr., Tech. and Sci. Serv. Bul. 19 (1923), pp. 8, pls. 2*).—This paper, submitted in February, 1921, notes briefly the occurrence in both Upper and Lower Egypt of a cotton boll disease ascribed to *Rhizopus nigricans*. This is said to act as a typical facultative boll parasite, starting at a wound and softening (within two days), reddening, and drying the boll as described in a publication by Willcocks (E. S. R., 40, p. 856), who called this condition "Mabroom bolls."

On the relation of temperature to the damping-off of garden-cress seedlings by Pythium debaryanum and Corticium vagum, T. Hemmi (*Phytopathology, 13 (1923), No. 6, pp. 273–282, figs. 2*).—Broadly speaking, the results of the two series of experiments here considered agree in showing that both *P. debaryanum* and *C. vagum* injure garden cress seeds and seedlings at temperatures between 10 and 30° C. High temperatures prevented germination, and lower temperatures were not tested. The Pythium strain here used was less injurious to Lepidium seedlings than was the Rhizoctonia strain for temperatures below 20°, but more injurious for temperatures above 24°. Both fungi were very injurious at from 17 to 26°. The temperatures of most active infection were *P. debaryanum* 20 to 30° and for *C. vagum* (Rhizoctonia) 16 to 24°. The Lepidium seeds used germinated well between 10 and 24°. Germination was markedly retarded or inhibited at temperatures above 30°.

Studies on the blight of cucurbits caused by Macrosporium cucumerinum E. & E., H. R. Brisley (*Phytopathology, 13 (1923), No. 5, pp. 199–204, figs. 3*).—The cucurbit leaf blight caused by *M. cucumerinum* is described as very important economically in those sections of Arizona which grow these plants for commercial purposes. Susceptible hosts include cantaloupe, squash, watermelon, cucumber, potato, and tomato. Spores, though spreading infection during the growing season, do not carry *M. cucumerinum* over winter. Mycelium, however, carries over viably in dried tissue. The minimum growth temperature is about 3°, the maximum about 45°, and the optimum 30° C. (86° F.)

Banana wilt of the manila hemp plant, H. A. Lee and F. B. Serrano (*Phytopathology, 13 (1923), No. 5, pp. 253–256*).—A disease of the manila hemp plant (*Musa textiles*), described by Reinking (E. S. R., 41, p. 841) as abacá heart rot, and ascribed to undetermined bacteria, has more recently increased in seriousness. Its investigation has been requested by commercial growers, and it has been found to be destructive only in the Provinces of Laguna and Cavite.

Inoculation studies made with three bacterial forms and a Fusarium found in connection with the disease gave positive infection percentages, respectively, of 5.10, 6.2, and 48.24 in contrast with 5.71 for the sterile needle puncture controls. The morphological and physiological characters of the hemp plant pathogene appear similar to those of the banana wilt organism, *F. cubense*, and the two are considered provisionally as the same species. Two banana plants, inoculated with the manila hemp Fusarium, gave very promptly banana wilt symptoms.

An improved formaldehyde tank for the onion drill, P. J. ANDERSON and A. V. OSMUN (*Phytopathology, 13 (1923), No. 4, pp. 161–168, figs. 3*).—Improvements indicated in the summary previously noted (E. S. R., 53, p. 852) have eliminated all sources of uncertainty and all causes of irregularity except that due to lack of uniformity in the operator's walking rate, which is claimed as the result of tests to be negligible.

The relation of soil moisture to the development of common scab of potato, G. B. SANFORD (*Phytopathology, 13 (1923), No. 5, pp. 231–236, figs. 3*).—Study carried on for two years at the department of field husbandry, University of Alberta, is said to show moisture to be directly or indirectly the main soil factor controlling potato scab development in the type of soil used. Abundant scab developed in very dry soils, while those sufficiently moist developed tubers almost entirely scab-free. The pH of the dry, scab-producing soils is throughout the season slightly higher than that of the moist soils. Scab developed abundantly in soils of pH 6 to 7. After a period apparently critical for susceptibility in the young tuber, very little scab infection occurs. A soil count shows the causal Actinomyces to be very abundant in Alberta soils.

A Fusarium wilt of spinach, C. W. HUNGERFORD (*Phytopathology, 13 (1923), No. 5, pp. 205–209, figs. 4*).—In the summer of 1919, and later, a disease of spinach was noted in gardens in Moscow and elsewhere in Idaho, and on study by C. D. Sherbakoff, the associated organism was diagnosed as a new species and named *Fusarium spinaciae* n. sp.

Sereh disease of sugar cane in Singapore, H. A. LEE (*Phytopathology, 13 (1923), No. 3, p. 145*).—In the Singapore Botanic Gardens, 1922, the author noted indications of the sereh disease, which is prevalent in Java, in canes which had been introduced from that island.

Internal breakdown of sweet potatoes, L. L. HARTER, J. I. LAURITZEN, and J. L. WEIMER (*Phytopathology, 13 (1923), No. 3, pp. 146, 147*).—An internal breakdown of sweet potatoes, usually most conspicuous several weeks after storing, has been examined from different sections without disclosing any organism. A cross section showed that many of the cells have been pulled apart, the resulting cavities looking somewhat cottony, and that the starch in the vicinity has been largely used up. The trouble is more prevalent under fairly dry conditions.

Mottle-necrosis of sweet potatoes, L. L. HARTER, J. I. LAURITZEN, and J. L. WEIMER (*Phytopathology, 13 (1923), No. 3, pp. 145, 146, fig. 1*).—For several years the authors collected sweet potatoes from different portions of the United States which showed in any part of the potato's length a brown irregularly formed discoloration in cross section with dead areas at the surface in severe or advanced cases. This trouble was particularly bad near Washington, D. C., in 1922 on Triumph and less so on Little Stem and Big Stem Jerseys. The dead spots yielded in most cases no organisms, in some a Penicillium, and in one or two cases species of Fusarium, while a North Carolina collection yielded *F. oxysporum.* Inoculation tests always gave negative results.

An important period in the life history of two bacterial organisms causing leaf-spots on tobacco, W. D. VALLEAU (*Phytopathology, 13 (1923), No. 3, pp. 140–144, fig. 1*).—Tobacco angular leaf spot and wildfire have been important economically in Kentucky since 1920. The present note records observations on the primary infection of young plants on the seed bed, and on its bearings. Though observations during three years have given little or no information as to the actual origin of the organisms in the beds, they have shown that infection occurs when the largest leaves spread out so that their

tips come in contact with the moist soil, and that in this way primary infection occurs, subsequent ("secondary") infection resulting apparently from splashing, from movements of leaves or of insects, or from water flow on the beds.

When sulfur was used at the rate of 500, 1,000, and 2,000 lbs. per acre, germination proceeded normally, but the young plants died on the sulfured beds in numbers nearly proportional to the amount of sulfur used. No infected leaves were found in the treated plats, but diseased plants were found in the untreated control plat and in the plat planted with commercial seed without treatment. The infected plats became conspicuously unhealthy, and the relation between the primary leaf infections and soil infection was very marked. The infections could be traced to contact of the first, second, third, or fourth leaf tips with the soil.

Because of stand injury, the author does not recommend the sulfur treatment as a control measure, but it appears that complete control of these diseases may be obtained by applications of toxic materials early enough to prevent multiplication of the organisms in the soil.

Lightning injury to tomatoes, H. D. BROWN and M. W. GARDNER (*Phytopathology, 13 (1923), No. 3, p. 147, fig 1*).—Killing of tomato plants in a somewhat circular area about 40 ft. in diameter is described as less severe from center to circumference, the injured plants showing a typical hollow-stem condition characterized by the collapse of the pith. Evidence was furnished that lightning had struck in this vicinity.

Studies on Urocystis tritici, the organism causing flag smut of wheat, R. J. NOBLE (*Phytopathology, 13 (1923), No. 3, pp. 127–139, pl. 1, figs. 2*).—In the present investigations to determine the conditions leading to more vigorous germination of the spores of flag smut (*U. tritici*), practically no spores germinated in ordinary nutrient solutions, and in from 4 to 16 days only a few spores had germinated in distilled water. Changes in the pH alone and in surface tension appeared to be of little significance.

Spores presoaked for several days in distilled water to which small portions of young wheat plants were then added showed from 70 to 95 per cent germination. Presoaked spores germinated when transferred to wheat plant infusions of appropriate dilution or to a distillate therefrom. The stimulatory substances are volatile, but not yet determined. Young tissues of other cereals and other plants also stimulate spore germination, and so do uninjured as well as cut tissues. After spores had been soaked in water for 28 days they still responded somewhat to stimulating substances.

The minimum temperature appears to be about 5° C., but tubes will grow at 0°. The maximum seems to be just below 32°, and the optimum between 18 and 24°.

The effect of temperature varies with the previous treatment of the spores, in ways which are detailed. Cultural practices may result in germination of spores in the soil. Considerable variation with conditions may occur in the morphologic features of the promycelia and of the sporidia.

Fusicoccum canker on apple, C. CHUPP and G. L. CLAPP (*Phytopathology, 13 (1923), No. 5, pp. 225–230, pl. 1*).—Young apple trees at points in New York are affected with a canker yielding a fungus which has been placed under a new species and is described as *F. pyrorum*.

Studies on the so-called black heart disease of the apricot, H. CZARNECKI (*Phytopathology, 13 (1923), No. 5, pp. 216–224, pl. 1, figs. 4*).—A disease of apricot suddenly wilting the foliage owing to gum formation in the xylem vessels, and associated with a Verticillium, apparently a new species, has been partially studied. Tree surgery or removal is suggested.

The control of raspberry mosaic, J. F. Hockey (*Abs. in Phytopathology, 13 (1923), No. 6, p. 292*).—Raspberry mosaic roguing experiments in commercial plantations during 1921 reduced mosaic incidence in 1922 in the three fields tested from 4.71 to 0.33 per cent, from 11.7 to 1.25, and from 31.17 to 2.27 per cent, respectively. It is considered evident that by thorough roguing of one- and two-year-old plantations the disease can be profitably controlled, but roguing of fruiting plantations over three years old is not regarded as generally advisable.

A Meliola disease of cacao, F. L. Stevens and R. I. Dowell (*Phytopathology, 13 (1923), No. 5, pp. 247–250, figs. 3*).—A possibly serious cacao (*Theobroma cacao*) leaf spot disease noted at Coverden, British Guiana, is recorded, the associated fungus being described as the new species *M. guianensis*. The Meliola was overgrown in some instances by a Nectria, apparently *N. portoricensis*, or else by a Helminthosporium, which is described as the new species *H. guianensis*.

Peony diseases, J. G. Coulson (*Abs. in Phytopathology, 13 (1923), No. 6, pp. 292, 293*).—A study applied to peony at Macdonald College, Province of Quebec, shows it to be subject to Botrytis blight (*B. paeoniae*), Cladosporium leaf blotch (*C. paeoniae*), Septoria leaf spot (*S. paeoniae berolinensis*), mosaic, two leaf spots of unknown causation which are described, and a disease of underground parts associated with a Fusarium.

Dothichiza canker on Norway poplar, F. Detmers (*Phytopathology, 13 (1923), No. 5, pp. 245–247, pl. 1*).—The author records the occurrence of Dothichiza canker (*D. populea*) on *Populus eugenei* in Ohio. In this connection, a brief statement is made regarding the origin, qualities, uses, and value of this hybrid poplar.

The genus Polystictus and decay of living trees, J. R. Weir (*Phytopathology, 13 (1923), No. 4, pp. 184–186*).—Extensive field observations have shown that some of the common species of Polystictus are not confined entirely to the wood of dead trees. Actual cases of observed invasion of sapwood or heartwood of living trees include *P. abietinus* on *Abies grandis*, *Tsuga heterophylla*, *Thuya plicata*, and *A. balsamea*, all in low condition as regards vigor; *P. biformis* (*P. cervinus*) on *Quercus rubra* and *Fagus atropunicea; P. cinnabarinus* on *Betula occidentalis; P. conchifer* on *Ulmus* spp.; *P. floridanus* (*Poria lindbladii*) on *Liquidambar styraciflua* and *Chamaecyparis thyoides; Polystictus hirsutus* on plum, cherry, prune, peach, apple, *Alnus tenuifolia*, *B. occidentalis*, *Acer rubrum*, *Q. prinus*, *Q. coccinea*, and *Castanea dentata; P. lacteus* on plum, cherry, peach, apple, and species of Acer, Platanus, Quercus, and Ailanthus; *P. pargamenus* on *Q. alba*, *Q. coccinea*, *Q. marilandica*, *Acer saccharum*, *B. lutea*, *Fraxinus americana*, *Nyssa sylvatica*, and *Populus tremuloides; P. pinsitus* on *Juniperus virginiana* and *Chamaecyparis thyoides; P. versicolor* on *Catalpa* sp. and other trees; and *P. zonatus* on species of Populus and Salix.

While species of Polystictus do not often pass to heartwood or adjacent sapwood they may do considerable injury in trees of reduced vigor. They may cause loss of cut material left too long in the woods, or may hasten the decline of street or park trees.

ECONOMIC ZOOLOGY—ENTOMOLOGY

Wild life in Kentucky, W. D. Funkhouser (*Ky. Geol. Survey, 6. ser., 16 (1925), pp. [11]+385, pl. 1, figs. 89*).—An annotated list is given of the reptiles, birds, and mammals of Kentucky, together with a discussion of their appearance, habits, and economic importance.

Some birds, game, and fish of Alabama (*Montgomery: Ala. Dept. Game and Fisheries, 1925, pp. 152, pls. 13, figs. 9*).—This is a popular account of some of these animals in Alabama.

The big game animals of Yellowstone National Park, E. HELLER (*Roosevelt Wild Life Bul. [Syracuse Univ.], 2 (1925), No. 4, pp. 405–467, pls. 2, figs. 67*).—Accounts are given of the habits of 12 big-game animals occurring in the Yellowstone Park.

Status of the pronghorned antelope, 1922–1924, E. W. NELSON (*U. S. Dept. Agr. Bul. 1346 (1925), pp. 64, pls. 6, figs. 21*).—This extended account of the pronghorn, or American antelope (*Antilocapra americana*), deals with their former and present abundance, characteristics, chosen habitat, conservation and control, conservation organizations and the antelope, the Washington conference on the conservation of the pronghorn, establishment of antelope refuges in Nevada, the proposed Owyhee antelope and sage hen refuge in Idaho, restocking experiments in 1924, methods of capturing and transplanting antelope, and the results of a census of existing antelope.

Game laws for the season 1925–26, G. A. LAWYER and F. L. EARNSHAW (*U. S. Dept. Agr., Farmers' Bul. 1466 (1925), pp. II+46*).—This is the twenty-sixth annual summary of the provisions of Federal, State, and Provincial game laws and regulations (E. S. R., 52, p. 55).

Laws relating to fur animals for the season 1925–26, F. G. ASHBROOK and F. L. EARNSHAW (*U. S. Dept. Agr., Farmers' Bul. 1469 (1925), pp. II+29*).—This is the eleventh annual publication on the subject (E. S. R., 52, p. 55).

The food of ground squirrels, W. T. SHAW (*Amer. Nat., 59 (1925), No. 662, pp. 250–264, figs. 5*).—This is a report of studies of the Columbian ground squirrel (*Citellus columbianus columbianus*) conducted at the Washington College Experiment Station in connection with work noted (E. S. R., 53, p. 756).

Control of the California ground squirrel, J. DIXON (*California Sta. Circ. 296 (1925), pp. 15, figs. 3*).—This is a revision of Circular 181, previously noted (E. S. R., 38, p. 456.)

Birds I have known, R. H. LAIMBEER (*New York and London: G. P. Putnam's Sons, 1923, pp. XVIII+401, pl. 1, figs. 98*).—This is a popular account.

The birds of the Yellowstone National Park, M. P. SKINNER (*Roosevelt Wild Life Bul. [Syracuse Univ.], 3 (1925), No. 1, pp. 192, pls. 6, figs. 47*).—Two hundred and two forms of birds are listed by the author as occurring in Yellowstone Park.

Life histories of North American wild fowl: Order Anseres (part), A. C. BENT (*U. S. Natl. Mus. Bul. 130 (1925), pp. X+376, pls. 60*).—This, the fifth in a series of bulletins on the life histories of North American birds, deals with the ducks, geese, and swans, of the order Anseres, considered in part in the fourth number of the series (E. S. R., 49, p. 756).

Food of American phalaropes, avocets, and stilts, A. WETMORE (*U. S. Dept. Agr. Bul. 1359 (1925), pp. 20, pls. 3*).—The economic status of five species of shore birds, namely, the red phalarope (*Phalaropus fulicarius*), northern phalarope (*Lobipes lobatus*), Wilson phalarope (*Steganopus tricolor*), avocet (*Recurvirostra americana*), and the black-necked stilt (*Himantopus mexicanus*), is here discussed. Material identified in the food of these shore birds, including the results of examinations of 155 stomachs of the northern phalarope, 106 stomachs of the Wilson phalarope, 80 stomachs of the black-necked stilt, and 67 stomachs of the avocet is reported upon in tabular form. A report on 36 stomachs of the red phalarope is included.

The buff-backed egret (Ardea ibis L., Arabic Abu Qerdan) as a factor in Egyptian agriculture, T. W. KIRKPATRICK (*Egypt Min. Agr., Tech. and Sci. Serv. Bul. 56 (1925), pp. 28*).—The author presents detailed lists of the

stomach contents of 139 individuals collected, notes on the systematic position and economic importance of the various insects and other animals comprising its food, an estimation of the food of a single bird during the different seasons of the year, etc. Because of the varied diet of this bird, the author has found it difficult to arrive at a definite decision as to its economic status.

Some results of bird banding in Europe, F. C. LINCOLN (*Auk, 42 (1925), No. 3, pp. 358–388, pl. 1, figs. 7*).—A report of work being conducted abroad.

Land crabs as agricultural pests in western India, P. V. WAGLE (*Bombay Dept. Agr. Bul. 118 (1924), pp. [2]+47, pls. 7*).—This is a report upon two years' work with land crabs in western India, where they have attracted considerable attention as serious agricultural pests. The important species are *Gecarcinucus jacquemontii* Edws., *Paratelphusa* (*Barytelphusa*) *guerini* Edws., *P.* (*Barytelphusa*) *jacquemontii* (Rathb.), and *P.* (*Paratelphusa*) *spinigera*.

[Economic insects in Florida and their control] (*Fla. State Hort. Soc. Proc., 37 (1924), pp. 105–107, 112–126, 216–219*).—Papers relating to the subject presented at the annual meeting of the Florida State Horticultural Society held at Tampa in April, 1924, include the following: Crotalaria as a Trap Crop for Pumpkin Bugs, by J. R. Watson (pp. 105–107); The Economic Spraying of the Citrus Grove, by H. E. Stevens (pp. 112–117); Purple Scale and Its Control Following the Use of Bordeaux Oil Emulsion for Melanose, by W. W. Yothers (pp. 118–122); The Cottony Cushion Scale Vedalia Situation in Florida, by E. W. Berger (pp. 123–126); and Chinch Bug Control on St. Augustine Grass, by A. H. Beyer (pp. 216–219).

Soil insects, A. E. CAMERON (*Sci. Prog. [London], 20 (1925), No. 77, pp. 92–108*).—This paper, presented before the British Association for the Advancement of Science at Toronto in August, 1924, gives a brief review of past work, followed by a discussion at some length of soil insects, their habitat, and means of control. A bibliography of 27 titles is included.

White grubs, Lachnosterna sp., and larvae of the weevil root-borer, Diaprepes spengleri L., attacking sugar cane in the Guanica District of Porto Rico, and methods practiced for controlling them, E. H. BARROW (*Jour. Dept. Agr. Porto Rico, 8 (1924), No. 2, pp. 22–26; also in Planter and Sugar Manfr., 75 (1925), No. 3, pp. 49, 50*).—This is a report of work in Porto Rico.

Household insects and their control, G. W. HERRICK (*Cornell Reading Course for the Home, No. 134, rev. (1923), pp. 40, figs. 26*).—This practical account is a revision of that published in 1920 (E. S. R., 45, p. 552.)

Common parasites of farm animals: Their prevention and treatment, L. S. BACKUS (*Missouri Sta. Circ. 134 (1925), pp. 16, fig. 1*).—This is a practical account of the more important parasites, their parasitism of farm animals, and means for combating them.

Handbook of tropical diseases, edited by C. MENSE (*Handbuch der Tropenkrankheiten. Leipzig: J. A. Barth, 1924, 3. ed., vol. 1, pp. XVIII+713, pls. [11], figs. 341*).—This work deals with the arthropods of importance (1) in transmitting and (2) in exciting disease in the Tropics (pp. 1–469). Among those considered at some length are the ticks (pp. 15–60), lice (pp. 62–107), cimicids (pp. 113–132), fleas (pp. 133–167), mosquitoes (pp. 176–303), other Diptera (pp. 304–391), mites (pp. 403–421), arachnids (pp. 421–427), scorpions (pp. 427–430), and miscellaneous insects (pp. 432–469). Bibliographies accompany the several accounts.

A monograph of the Plecoptera or stoneflies of America north of Mexico, J. G. NEEDHAM and P. W. CLAASSEN (*La Fayette, Ind.: Thomas Say Found. of Ent. Soc. Amer., 1925, pp. 397, pls. 50, figs. 29*).—The author recog-

nizes 207 species, grouped in 24 genera, as occurring in North America north of Mexico.

An investigation of the migratory locust in the State of Vera Cruz [trans. title] (*Monog. Inst. Hig.* [*Mexico*], *No. 3* (*1925*), *pp. III+140, pls. 53, fig. 1*).—This is a report of investigations made of the migratory locust in the State of Vera Cruz by a Government commission consisting of C. C. Hoffmann, A. Dampf, and G. Varela.

The taxonomic value of the tergite preceding the supra-anal plate in males of the Acridinae, C. L. Corkins (*Colorado Sta. Bul. 301* (*1925*), *pp. 3–11, figs. 25*).—The author calls attention to the value of the supra-anal tergite in the classification of males of the Acridinae. An examination of the males of 15 Montana species, represented by 937 individuals, showed this character to be of as constant taxonomic value as its homologue in the Melanopli. A study made of the material in the collection of the Colorado Agricultural College further indicates that this structure is reasonably constant and has a distinct value in classification. Only in the genus Ageneotettix does there seem to be a lack of constancy of the structure of the furculae of the Colorado species. Descriptions of this structure in 25 species supplement drawings presented.

The chinch bug and its control, M. H. Swenk (*Nebraska Sta. Circ. 28* (*1925*), *pp. 34, figs. 6*).—This is a practical summary of information on the chinch bug and means for its control.

Woolly aphis investigations.—Effect of delayed planting on infestation of apple seedlings, G. W. Underhill (*Va. State Crop Pest Comn. Quart. Bul.*, 7 (*1925*), *No. 1, pp. 7, figs. 6*).—This is a preliminary report of experiments conducted at Richmond, in which vicinity the spring migration of the woolly aphis lasts from about May 10 to June 1. It being apparent that if apple seedlings planted for budding, which usually become infested the first season, can be held in cold storage and planted after the spring migrants of the woolly apple aphid have largely or entirely disappeared, the problem of root infestation during the first season will be solved, seedlings were held in cold storage at low temperatures during the spring of 1924 as late as May 19 and June 5. When removed from storage on these dates the buds were dormant, just as they were when stored, and all were in good condition. Even the last planting on June 5 made sufficient growth for satisfactory budding by the last of August, the late plantings, however, being smaller at the end of the season.

Root examinations made during the first week in November showed the first planting, made on May 5, to have 34.7 per cent spring or early infestation, 27 per cent of the roots being so severely infested that they would have to be thrown out as culls, and 16.7 per cent had a light infestation which took place in the fall season, making a total of 51.4 per cent infestation for the early planting. The second planting, made on May 19 when a large percentage of the winged (alate) migrants had disappeared, had only 25 per cent total infestation, with only 5 per cent severe enough to go in the cull pile. A delay of two weeks in planting reduced the percentage of severely injured roots from 27 to 2 per cent and the early, or spring, total infestation from 34 to 5 per cent. The third planting, made on June 5, had no trees with roots severely injured, and only 0.7 per cent of them with a medium heavy infestation. The ratio of bad roots was about 39 in the first planting to nearly 15 in the second to 1 in the last planting.

Insect enemies of the citrus aphid, F. R. Cole (*Fla. Grower*, *32* (*1925*), *No. 1, p. 7, figs. 3*).—A brief account of the insect predators and parasites of the citrus aphid.

Aphidid enemies of cotton, millet, and sorghum in French West Africa [trans. title], P. VAYSSIÈRE and J. MIMEUR (*Agron. Colon., 12 (1925), No. 88, pp. 121–152, pls. 2, figs. 5*).—An account is given of the cotton aphid, *Aphis sorghi* Theob., and *A. maidis* Fitch, their insect enemies and hyperparasites.

A study of the oyster-shell scale, Lepidosaphes ulmi (L.), and one of its parasites, Aphelinus mytilaspidis LeB., G. H. GRISWOLD (*New York Cornell Sta. Mem. 93 (1925), pp. 5–67, pls. 2, figs. 21*).—This memoir is in two parts:

I. *Biology and morphology of the two forms of the oyster-shell scale* (pp. 5–55).—Transfer experiments have shown that scales from apple can be made to complete their development on lilac and other host plants, but in no case could scales of the lilac form be made to live for any length of time on apple or pear. The study has clearly shown that differences occur in the appearance, in morphological characters, and in biological development of the two forms on these and on other host plants. Whether these differences are great enough to warrant the erection of a new species or only of a new variety for the form on lilac, the author is not yet ready to say. A bibliography is included (pp. 49–55).

II. *Biology of a parasite of the oyster-shell scale* [*A. mytilaspidis*] (pp. 56–67).—The author finds *A. mytilaspidis* to be the most common parasite of the oyster-shell scale at Ithaca, as well as in many other parts of the United States, it being both parasitic and predatory. The first generation develops on the second instar of the coccid, while larvae developing later obtain their nourishment from the adults. Overwintering larvae are often predacious on the eggs of the oyster-shell scale. Males of the parasite are found to be rare, none having developed among 169 adults reared during the winter of 1919–20. Feeding at oviposition holes is a common practice with the females of *A. mytilaspidis*. This chalcid may place its eggs either on the dorsum or on the venter of the host. In late summer the eggs are often found among the eggs of the coccid. The incubation period of the egg is said to be from three to four days. There appear to be three, or possibly four, generations at Ithaca. Individuals of the first generation require about a month to complete their development. Larvae hatching from eggs laid early in July were found to change to pupae by July 22, and adults began emerging in vials at the insectary on July 31. A bibliography is included (pp. 66, 67).

The Diaspine Coccidae of Japan, I, I. KUWANA (*Japan Dept. Agr. and Com., Bur. Agr., Injur. Insects and Pests Ser. No. 14 (1925), pp. [2]+18, pls. 3*).—The genera Poliaspis, Ischnaspis, and Parlatoria are dealt with, the first two being represented in Japan by a single species each and Parlatoria by six species.

A general survey of the raw silk and silkworm industry in China (*Chinese Econ. Mo., 2 (1925), No. 6, pp. 1–29*).—In addition to statistical data on the production of raw silk in China, information is given on mulberry cultivation, the rearing of the silkworm, etc., in Kwangtung (which leads in the quantity of production), Kiangsu, Chekiang, Anhwei, Hunan, Hupeh, Szechwan, Shantung, Shansi, and other provinces.

Control work with the grapevine moths (Cochylis and Endemis) from 1922 to 1924 [trans. title], H. FAES and M. STAEHELIN (*Ann. Agr. Suisse, 26 (1925), No. 1, pp. 131–154, figs. 10*).—A report of work with *E. botrana* and *C. ambiguella* in Switzerland.

A bibliography of the European corn borer (Pyrausta nubilalis Hbn.), J. S. WADE (*U. S. Dept. Agr., Misc. Circ. 46 (1925), pp. 20*).—The author here brings together all of the more important available references to the European and American literature on this insect down to January 1, 1925.

The European corn borer in Pennsylvania, C. H. HADLEY (*Penn. Dept. Agr. Circ. 2 (1925), pp. 12, figs. 7*).—This is a practical summary of information on the European corn borer, now a pest in all of Erie and Crawford Counties and in parts of Mercer and Warren Counties in northwestern Pennsylvania.

The European corn borer [trans. title], L. R. SOBRERO (*Gac. Rural [Buenos Aires], 18 (1924), No. 209, pp. 439–441, figs. 3; abs. in Rev. Appl. Ent., 13 (1925), Ser. A, No. 4, p. 138*).—The occurrence of this borer in various parts of the corn-growing regions of Argentina is recorded.

The survival of pink bollworm larvae in buried seed during the winter in Egypt, C. B. WILLIAMS and I. BISHARA (*Egypt Min. Agr., Tech. and Sci. Serv. Bul. 58 (1925), pp. 1–7, pls. 2*).—The results obtained by Willcocks (E. S. R., 45, p. 657) have been confirmed by the authors, namely, (1) the death rate of larvae buried in the ground in winter is least near the surface and greatest at greater depths, there being no survival at 30 cm. (11.7 in.) and (2) the moister the land is kept during the winter the more rapid is the death rate of the larvae.

The fruit tree leaf roller: Its control in southern Idaho by the use of oil emulsion sprays, C. WAKELAND (*Idaho Sta. Bul. 137 (1925), pp. 3–11*).—Based on extensive experiments in 1923 and 1924, this bulletin is intended to furnish timely information on the preparation and use of oil emulsion sprays for controlling the fruit tree leaf roller in southern Idaho.

Oil sprays were found to be much more effective than lead arsenate, the latter proving of little value though applied in both the prepink and calyx sprays at double the strength ordinarily used for codling moth control. The highest percentage of kill on an individual tree was obtained by Dormoil at a dilution of 6.64 per cent, the highest average percentage of kill occurred when Diamond paraffin oil-potash fish-oil-soap emulsion was used at a dilution of 6.64 per cent, and the lowest individual kill and the lowest average kill were obtained by Dormant Soluble Oil at a dilution of 6.64 per cent. The addition of phenol did not increase the efficiency of the emulsion, and increasing the percentage of the oil gave no better results. In comparative efficiency the three general classes of oil sprays ranked as follows: (1) Home-mixed potash fish-oil-soap emulsion, (2) home-mixed calcium-caseinate emulsion, and (3) commercial oil emulsions. The degree of difference in results with many of the emulsions was so slight that selections of the best oil under practical conditions would be determined largely by price.

Biological studies of the green clover worm, C. C. HILL (*U. S. Dept. Agr. Bul. 1336 (1925), pp. 20, figs. 15*).—This bulletin embodies technical details regarding the biology of the green clover worm, which were omitted from the account previously noted (E. S. R., 39, p. 865).

In studies at Nashville, Tenn., the author found that the period of oviposition may last 11 days or more, the eggs hatching during the summer and early fall in from 2 to 5 days, but requiring as many as 14 days during cool weather. The larval period lasts about 23 days, during the course of which the caterpillar molts five times and, in warm weather, spends approximately 2 days as a prepupa inside the cocoon. The pupal stage lasts from 7 to 24 days except when lengthened by hibernation. Technical descriptions of its several stages are included. Four distinct generations were observed in Tennessee during the season of 1916, but farther north the number decreases to three and even two per annum.

Ten species of parasites were reared from the green clover worm in Tennessee, and 18 more have been reported from other localities, 14 being Hymenoptera and 14 Diptera.

The pear-midge pest: Spraying experiments at Henderson, R. H. MAKGILL (*New Zeal. Jour. Agr., 30 (1925), No. 4, pp. 224–228*).—This is a report of control work with the pear midge, the results of which indicate that by the use of nicotine it can be kept in check during October and the first two weeks of November sufficiently to permit the early twig growth to become established and to enable the trees to set a fair covering of leaves.

The hibernation and parasitism of a fruit fly in the Stanthorpe district, F. A. PERKINS and G. H. HARDY (*Queensland Agr. Jour., 23 (1925), No. 5, pp. 431–437, figs. 2*).—In part 1 (pp. 431, 432) Perkins reports upon the discovery of either the fruit fly (*Dacus tryoni* Frog.) or the Solanum fly (*D. tryoni solani*) in the fruit of *Notelaea longifolia velutina* during the winter. The results of incubation tests are reported upon by G. H. Hardy in part 2 (pp. 432–437). The rearings have shown parasitism by *Diachasma tryoni* Cam. to be so great that only a small percentage of the flies breeding in the fruit of *N. longifolia* in the Stanthorpe district could have survived the winter.

The "blood meal" of Phlebotomus argentipes identified by precipitin antisera, R. B. LLOYD, L. E. NAPIER, and R. O. A. SMITH (*Indian Jour. Med. Research, 12 (1925), No. 4, pp. 811–817*).—The authors found the identification of the blood contained in *P. argentipes* by specific antisera to give a striking confirmation of a view deduced from field observations. The results point to the following conclusions:

"(1) *P. argentipes* will feed on cows in preference to man. (2) This preference is not shown in the case of other animals so far considered. (3) In view of the possibility that *P. argentipes* is the transmitter of kala-azar, these findings are important as they bring into line certain epidemiological observations with regard to the presence or absence of cows and the distribution of kala-azar in Calcutta. (4) A possible line of prophylaxis against this disease is suggested by the above findings."

The puparia and larvae of sarcophagid flies, C. T. GREENE (*U. S. Natl. Mus. Proc., 66 (1925), Art. 29, pp. 26, pls. 9*).—This is a report of studies carried on in continuation of those of the puparia of 100 muscoid flies, previously noted (E. S. R., 46, p. 661). It is pointed out that so far as known none of the species of Sarcophagidae deposit eggs, but all deposit first-stage larvae, which start to work in immediately and under favorable conditions develop very rapidly. A table for the identification of the puparia is followed by descriptions of the puparia of 41 species and of the larvae of 5.

The toxic action of oil films upon mosquito larvae with particular reference to pine oil films, M. E. BARNES (*Amer. Jour. Hyg., 5 (1925), No. 3, pp. 315–329*).—The author finds that "pine oil has a powerful soporific or paralyzing effect upon mosquito larvae and pupae, and in effective doses results in their death either directly or, apparently, by drowning while under the effects of the drug. Anopheline and culicine larvae are able to withstand prolonged submersion in water. Anopheline and culicine larvae, in many cases, may be resuscitated after prolonged submersion, ever after being in contact with oil films. A method of resuscitating supposedly drowned larvae is described. Crude oil is an efficient and economical vehicle for carrying pine oil to larvae by means of film dosage. A mixture of crude oil and pine oil in the proportions of nine parts of the former to one of the latter produces a better film than either ingredient, and one which is highly effective in destroying all stages of anopheline and culicine larvae and pupae. The ova of *Anopheles quadrimaculatus* Say are partially resistant to pine oil acting through films."

Some observations on root grubs (Leucopholis irrorata Chevr.) in the Philippines and suggestions for their control, F. Q. OTANES (*Philippine*

Agr. Rev., *17 (1924), No. 2, pp. 109–119, pls. 3*).—This is a report of studies of the scarabaeid bettle *L. irrorata*, which damages sugar cane, corn, rice, mango, etc.

Striped cucumber beetle: How to control it, F. H. CHITTENDEN (*Canner*, *61 (1925), No. 3, pp. 33–35*).—A brief account in which the use of nicotine dust is particularly recommended.

A study of the cane borer, R. obscura, and its parasite, C. sphenophori, at Paauhau Sugar Plantation Company, C. E. PEMBERTON (*Hawaii. Planters' Rec.*, *29 (1925), No. 2, pp. 174–185; also in Facts About Sugar, 20 (1925), No. 29, pp. 682–685, 690*).—This is a discussion of the extent of damage caused by *Rhabdocnemis obscura* and the possibilities of overcoming it by the use of parasites, notably *Ceromasia sphenophori*.

Instructions for combating the coffee berry borer (Stephanoderes coffeae Hag.) [trans. title], A. NEIVA, E. NAVARRO DE ANDRADE, and A. QUEIROZ TELLES (*Rev. Agr. Puerto Rico*, *14 (1925), No. 4, pp. 264–273, figs. 3*).—A brief summary of information on this pest in Brazil.

Seasonal variation as it affects the activity and control of the alfalfa weevil in Idaho, C. WAKELAND (*Idaho Sta. Bul. 138 (1925), pp. 3–11, figs. 3*).—The author here reports upon studies of the development and activity of the alfalfa weevil in southwest Idaho, particularly during the seasons of 1923 and 1924. A brief description is given of the method followed in obtaining and tabulating information.

"Observations made during four seasons have shown that from the time when the number of young larvae in a field exceeds about 1,000 in each 100 strokes of the net until the time when they decrease to less than that number, the amount of feeding is great enough to cause serious and, usually, continuous damage. From the . . . charts it is evident that the greatest number of larvae occurred 28 days earlier in 1924 than in 1923, and also that, at the time of the greatest larval population, there were approximately 50 per cent more larvae in the field during the latter year. In 1923 an increasingly abundant number of worms caused continuously increasing injury for a period of 22 days longer than in 1924. During the former year 30 days elapsed after the date of application of the first spray until injury began to abate naturally, while during the latter year this period of time was but 5 days."

It is pointed out that there is but little danger of poisoning livestock by sprays.

The brood-rearing cycle of the honeybee, W. J. NOLAN (*U. S. Dept. Agr. Bul. 1349 (1925), pp. 56, pl. 1, figs. 29*).—In this account the author discusses the methods employed, the annual brood-rearing cycle, the colonies used in 1921, brood rearing of a typical colony for two successive seasons, general observations on the remaining colonies, the records for 1921, observations in 1920, migrations of the queen within the hive, compactness of brood nest, time relation of brood rearing to nectar gathered, and egg laying. Tables and graphs are included, together with a list of 14 references to the literature cited.

A survey of beekeeping in California and the honeybee as a pollinizer (*California Sta. Circ. 297 (1925), pp. 22, fig. 1*).—Two papers are presented:

A survey of beekeeping in California, G. H. Vansell (pp. 1–16).—An apicultural survey of the State was made in order to determine the present conditions, possibilities, and needs of the business of beekeeping, with special reference to the problems confronting the beekeeper at the present time. The distribution of colonies, based upon the census of 1920, is tabulated and mapped by counties, and races of bees are discussed, as are bee and queen raising, classes and kinds of honey, wax, profits in beekeeping, nectar and pollen plants,

disease, and the wax moth. A brief discussion of the needs of the beekeeping industry in California follows. Lists of bulletins, journals, and books are included.

The honeybee as a pollinizer, E. R. de Ong (pp. 17–22).—Attention is called to the necessity for the pollination of deciduous fruit trees, excepting certain nuts, and it is pointed out that bees are best adapted by the structure of the body for carrying the pollen. A comparison made of the flight activity of the honeybee with the blooming period of the chief deciduous fruits, presented in tabular form, shows an intimate relationship between meteorological factors and the activity of the honeybee. A brief account of the management of bees in the orchard follows, in which it is pointed out that one colony to the acre is usually considered sufficient.

Forty-fifth annual report of the Beekeepers' Association of the Province of Ontario, 1924 (*Ontario Dept. Agr., Beekeepers' Assoc. Ann. Rpt., 45 (1924), pp. 111*).—Included in this report of proceedings are papers and discussions on Wintering Nuclei and Full Colonies, by G. B. Gooderham (pp. 9–17); Comb Honey Production, by J. E. Crane (pp. 17–28); Extracted Honey Production, by M. Pettit (pp. 28–40); Queen Rearing, by A. Latham (pp. 40–44); Grading and Shipping Comb Honey, by J. E. Crane (pp. 46–54); Use of Foundation, by W. A. Chrysler (pp. 54–56); Hodgson Extractor and Uncapping Machine, by A. F. Hodgson (pp. 56–58); Registration of Beekeepers, by D. A. Andrew (pp. 58–64); American Foulbrood of Bees: Experiments with Various Disinfectants on Infected Combs, by D. H. Jones (pp. 70–76); Results of Apiary Experiments in Sterilizing American Foulbrood Combs, by G. L. Jarvis (pp. 77–83); Queen-judging and Re-queening, by A. Latham (pp. 86–93); Co-operation in Disease Control, by G. L. Jarvis (pp. 93–98); Ontario Honey Producers' Co-operative, Limited, by A. G. Halstead (pp. 98–103); and Preparing the Crop for Market, by W. A. Weir (pp. 104–108). The text of the foulbrood act is appended.

Pteromalidae in Spain: A first note [trans. title], R. García Mercet (*Bol. R. Soc. Españ. Hist. Nat., 24 (1924), No. 9, pp. 421–430, figs. 4*).—Among the three species considered is *Tomocera californica* How., which is recorded for the first time in Europe, where in the vicinity of Barcelona it is a parasite of *Ceroplastes rusci* and *C. chinensis*.

Studies on the pear-stem girdler, Janus piri n. sp., H. Okamoto and S. Muramatsu (*Chosen Govt. Gen. Agr. Expt. Sta. Bul. 2 (1925), No. 1, pp. 9–16, pl. 1*).—This is an account of a cephid which is the source of injury to the pear tree in Chosen (Korea). The appearance of the injured trees is very much the same as those injured by the oriental peach moth. Its attack is said to be confined solely to pear trees, the European pear (*Pyrus communis*) being attacked to a greater extent than the Japanese pear (*P. sertiana*).

The presence of Ornithodoros megnini in Chile [trans. title], J. Descazeaux (*Bul. Soc. Path. Exot., 18 (1925), No. 5, pp. 408, 409*).—The spinose ear tick is said to occur in central and northern Chile, particularly in the ears of young calves, the greatest numbers being found during December and January.

The cattle-tick (Haemaphysalis bispinosa) investigations during 1923–24, J. G. Myers (*New Zeal. Dept. Agr. Bul. 116 (1924), pp. 105, figs. 17*).—This is a report of investigations of the life history, bionomics, etc., of *H. bispinosa* in New Zealand.

ANIMAL PRODUCTION

Energy-production coefficients of American feeding stuffs for ruminants, G. S. FRAPS (*Texas Sta. Bul. 329 (1925), pp. 3–62*).—The digestion coefficients as determined in all the American experiments dealing with the digestibility of feeding stuffs by ruminants have been compiled, and the variation found has been studied statistically. Common errors in calculating rations on the basis of digestible nutrients are pointed out, and coefficients for calculating the net energy values of American feeds are given with the method employed in making the calculations. The quantity of crude fiber in a feed was found very important in influencing its net energy value. Studies of the causes of variation in the digestibility in feeds in different experiments have indicated that there is an even chance that differences in digestion by individual animals may cause variations of approximately 3 per cent in the productive value of corn, wheat, and similar feeds, about 6 per cent with the usual run of feeds, and about 14 per cent in low grade feeds. The productive energy may vary 12 per cent in approximately 9 per cent of the cases. The variation is of course reduced when several animals are used for making the determinations.

[Beef cattle experiments at the Charlottetown, P. E. I., Experimental Station], J. A. CLARK (*Canada Expt. Farms, Charlottetown (P. E. I.) Sta. Rpt. Supt. 1923, pp. 7, 8*).—The following experiments were conducted:

Methods of feeding [steers].—The combined results of experiments conducted from 1920 to 1923 in studying different methods of feeding steers are reported. One group of steers each year received loose hay, whole turnips, and grain fed separately; a second group received pulped turnips and cut hay and grain, all of which were fed separately; a third group received pulped turnips, chopped hay, and grain, mixed prior to feeding; while a fourth group received pulped turnips and chopped hay mixed with the grain and moistened prior to feeding. The separate feeding of the grain, pulped turnips, and chopped hay resulted in the highest gains and the lowest cost per pound of gain. The feeding of loose hay and whole turnips was second in the production of gains, and also required the least labor.

Dehorning steers.—In experiments conducted, no advantage was shown for dehorned or polled steers over horned steers as to their ability to make gains when tied, but dehorned steers made greater gains when fed loose than horned steers which were tied. It is concluded that dehorned steers are more contented, feed better, and usually command a higher price.

[Experiments with beef cattle at the Scott, Sask., Experimental Station], M. J. TINLINE (*Canada Expt. Farms, Scott (Sask.) Sta. Rpt. Supt. 1923, pp. 3–5*).—Results of the following feeding experiments are briefly noted:

Winter steer feeding.—In a test to determine the ability of yearlings and 2-year-olds to use silage in the ration, lots of 10 steers of each age were selected and fed from November to May. The grain ration consisted of oats, shorts, and barley, with straw and silage as roughages. The results showed that the yearlings required 760 lbs. of grain per 100 lbs. of gain as compared with 956 lbs. by the 2-year-olds. The average profit per steer was calculated at $19.29 for the yearlings and $15.90 for the 2-year-olds.

Silage v. no silage for fattening yearling steers.—One group of yearling steers received all the silage it would consume, while another group received no succulent feed. Both lots received the same grain ration and a full feed of straw. The silage-fed steers were more uniformly finished than the ones

receiving no silage, and they required 760 lbs. of grain per 100 lbs. of gain as compared with 1,050 lbs. of grain per 100 lbs. of gain by the steers receiving no silage.

Quantity of silage for fattening steers.—Two lots of steers were fed similarly except that one received 30 lbs. and the other 20 lbs. of immature sunflower silage per head daily. The steers receiving the larger amount of silage increased more in value, consumed less straw, and required 52 lbs. less grain to make 100 lbs. of gain.

[Experiments with sheep at the Lethbridge Experimental Station], W. H. FAIRFIELD and V. MATTHEWS (*Canada Expt. Farms, Lethbridge (Alta.) Sta. Rpt. Supt. 1923, pp. 8–16*).—Results are briefly reported as follows:

Lamb feeding experiment.—Four lots of 50 lambs averaging approximately 75 lbs. in weight were compared during a 97-day experiment, all lots receiving equal amounts of grain. The average daily gains per head produced were for the lambs receiving alfalfa hay alone 0.31 lb., alfalfa hay and corn silage 0.36, alfalfa hay and sunflower silage 0.32, and alfalfa hay and oat sheaves 0.33 lb. It is pointed out that better gains were made in this experiment than in the preceding year when similar rations were compared, except that the grain then consisted only of whole oats while in the present experiment whole oats and barley were fed.

Pasturing sheep in forest reserve.—Ewes pastured on the forest reserve from June to October were divided into two lots. Lambing results showed that the lot receiving alfalfa hay but no silage produced 389 lambs averaging 20.96 lbs. on April 17, while the lot receiving the hay and sunflower silage produced 344 lambs averaging 22.32 lbs. The authors believe that the value of silage before lambing is questionable, but it appears to be beneficial after lambing in that it increases the milk supply. Data are given on the financial aspects of pasturing sheep on the forest reserve, not only for 1923 but for each of the three preceding years.

[Experiments with sheep at the Scott, Sask., Experimental Station], M. J. TINLINE (*Canada Expt. Farms, Scott (Sask.) Sta. Rpt. Supt. 1923, pp. 8–10, fig. 1*).—The results of the following experiments are briefly reported:

[*Cross-breeding sheep.*]—Shropshire ewes have been bred to rams of the Shropshire, Cheviot, and Rambouillet breeds. The average dressing percentage of the lambs from the Shropshire and Cheviot sires was 46, while that of the lambs from the Rambouillet sires was 43. The quality of the fleece of the Rambouillet lambs was superior.

Winter feeding of lambs.—Silage has invariably produced greater gains in lambs when fed in combination with a grain ration than turnips.

Prevention of goiter in lambs.—It has been found possible to prevent goiter in lambs by furnishing the ewes with salt containing potassium iodide.

[Experiments with swine at the Scott, Sask., Experimental Station], M. J. TINLINE (*Canada Expt. Farms, Scott (Sask.) Sta. Rpt. Supt. 1923, pp. 5–8, figs. 2*).—The results of the following experiments, dealing mostly with the feeding of swine, are briefly reported:

Tankage v. buttermilk v. grain only.—For a comparison of the advantages of adding tankage and buttermilk to the rations of pigs, three lots of five head each were selected for a 100-day experiment. The animals having 10 per cent tankage added to their grain ration made an average daily gain of 1.06 lbs. per head. Those receiving 6 lbs. of buttermilk per head daily in addition to a grain ration gained 1.15 lbs., while those receiving grain only made an average gain of 0.87 lb.

Whole grain v. chop.—In comparing whole and ground grain, pigs receiving whole grain made an average daily gain of 0.78 lb., while those receiving

ground grain made a corresponding gain of 0.87 lb. The feed requirement per 100 lbs. of gain was 55 lbs. less in the latter lot.

Self-feeder v. trough feeding.—Pigs fed in the self-feeder were found to be ready for market three weeks before those fed by hand, and their gains were 0.24 lb. greater per day, but the trough-fed pigs were considered to conform more closely to the bacon type, since the self-fed animals were very short bodied.

Rape pasture v. dry lot.—Pigs fattened on rape pasture made 0.07 lb. greater average daily gain per head than pigs fattened in dry lot. The pasture also saved 25 lbs. of grain per 100 lbs. of gain. It is calculated that 1 acre of rape pasture would be sufficient for 30 head of hogs in an average season.

Oat and barley chop v. oat and rye chop.—In this experiment oat and rye chop produced 6.06 lb. greater average daily gain per head than oat and barley chop, and required 33 lbs. less grain to produce 100 lbs. of gain.

Cross-breeding experiment.—In a comparison of cross-bred pigs, the average daily gains made were as follows: Purebred Yorkshires 0.98 lb., Berkshire sire × Yorkshire dam 0.97 lb., and Duroc-Jersey sire × Yorksbire dam 1.06 lbs. Though the most rapid gains and the least feed per unit of gain were required by the pigs of the latter cross, this type was not so satisfactory as the other pigs because the quality of the carcass was not so desirable for bacon.

Tankage v. selective feeding.—The following average daily gains were made by lots of pigs fed in different ways: Grain only 0.47 lb., grain plus tankage 0.58 lb., and grain plus access to beef scrap, tankage, lime, bone meal, fine coal, and salt 0.64 lb. The grain requirements per 100 lbs. of gain by the respective lots were 705, 566, and 513 lbs. It was pointed out that the lot receiving free choice of several supplements consumed large quantities of beef scrap, which materially increased the cost of feed.

Winter housing of swine.—In a comparison of methods of housing swine, the straw shed, which is the most cheaply built and most easily kept dry, has given the most satisfactory results, followed in order by the portable cabin banked with manure, and a large piggery.

Protein supplements for fattening swine, H. E. DVORACHEK, H. A. SANDHOUSE, and R. A. HUNT (*Arkansas Sta. Bul. 198 (1925), pp. 3–15, fig. 1*).—The results of six experiments dealing with the comparative value of cottonseed meal, linseed oil meal, peanut meal, velvet bean meal, gluten meal, ground soy beans, and tankage as protein supplements to corn for fattening swine are briefly reported.

In the first experiment, 6 lots of 5 shotes each, averaging slightly over 100 lbs. per head, were selected for comparing the protein supplements when hand-fed with corn 1:9 during the first 5 weeks and 1:8 during a second 5-week period. The average daily gains and feed consumed per 100 lbs. of gain by the different lots were, respectively, cottonseed meal 0.55 and 550.6 lbs., velvet bean meal 0.10 and 1,911.1, peanut meal 0.54 and 536.5, gluten meal 0.39 and 651.7, linseed oil meal 0.61 and 500.9, and tankage 0.41 and 613.2 lbs.

The second and third trials were for determining the most economical amount of tankage to feed with a ration of corn and shorts, the latter feed making up 20 per cent of each ration, while the amount of corn depended on the amount of tankage fed, which consisted of 5, 7.5, 10, and 12.5 per cent of the rations in the different lots. In the third experiment a fifth lot was given access to the same feeds in separate self-feeders. The respective average daily gains and feed consumption per 100 lbs. of gain by the different lots in the second experiment were 5 per cent tankage 1.89 and 402.6 lbs., 7.5 per cent tankage 1.89 and 403.1, 10 per cent tankage 1.95 and 390.2, and 12.5 per cent tankage 1.88 and 405.5 lbs., and in the third experiment 5 per cent tankage 0.99 and 463.8 lbs., 7.5 per cent tankage 1.02 and 446.9, 10 per cent tankage 1.03 and

445.7, and 12.5 per cent tankage 0.95 and 483.9 lbs. The self-fed lot made an average daily gain of 1.45 lbs. and consumed 479.2 lbs. of feed per 100 lbs. of gain.

In the fourth experiment 5 lots of 7 115-lb. pigs were used for comparing various protein supplements fed as 10 per cent of the ration with corn. The average daily gains and feed consumed per 100 lbs. of gain by the different lots were, respectively, ground soy beans 1.59 and 374.5 lbs., peanut meal 1.81 and 369.3, linseed oil meal 1.70 and 396.2, cottonseed meal 1.70 and 379.9, and tankage 1.98 and 345.7 lbs. The carcasses of these pigs were observed after slaughter and graded according to the amount of fat, amount of lean, and hardness of the fat. The relative order for the hardness of fat was tankage, cottonseed meal; peanut meal, soy beans, and linseed oil meal.

The rations of the pigs in the fifth and sixth experiment were self-fed free choice. All of the 8 lots fed in the fifth experiment received shelled corn and salt, and four of the lots had access to a mineral mixture of wood ashes, charcoal, and slaked lime (2:2:1). All of the five lots in the sixth trial received minerals consisting of salt, wood ashes, charcoal, and rock phosphate in equal parts. The respective average daily gains made by the lots receiving the different protein supplements and the feeds consumed per pound of gain in the fifth trial were as follows: Peanut meal without minerals 1.96 and 369.7 lbs., with minerals 2.19 and 360.0; ground soy beans without minerals 1.92 and 383.3 lbs., with minerals 2.23 and 359.1; cottonseed meal without minerals 2.31 and 315.3, with minerals 2.17 and 324.1; and linseed oil meal without minerals 1.29 and 407.8, and with minerals 1.71 and 388.7 lbs. The average daily gains and feed consumption of the lots in the sixth trial were cottonseed meal 1.93 and 362.6 lbs., linseed oil meal 1.35 and 417.2, tankage 1.69 and 346.3, peanut meal 1.80 and 347.9, and ground soy beans 1.50 and 393.5 lbs.

The authors conclude that cottonseed meal, peanut meal, and soy bean meal compared favorably with tankage as protein supplements to corn for fattening hogs and produced more economical gains, due to their lower cost. Velvet bean meal was unpalatable, as was linseed meal, and the one trial with gluten meal did not warrant its recommendation. Minerals increased the efficiency of peanut meal and soy bean meal but did not appear to improve the ration including cottonseed meal. The possibility of peanut meal and soy beans softening the fat is pointed out, as well as the dangers from feeding cottonseed meal over long periods due to its toxic properties.

The value and utility of hay for feeding draft horses [trans. title], N. Hansson (*Meddel. Centralanst. Försöksv. Jordbruksområdet* [*Sweden*], *No. 253* (*1924*), *pp. 33, figs. 2*).—In addition to a summary of Swedish feeding experiments conducted with draft horses showing the comparative feeding value of different feeds, this bulletin reports the results of comparative tests carried on at three country estates in which varying portions of the hay in the rations of draft horses were replaced by oats or corn. One horse of each team received each of the rations compared.

The results of the experiments indicated that 2.5 kg. of pasture hay has the value of one fodder unit. Horses may consume as much as from 18 to 20 kg. of hay per head daily, but this results in a considerable reduction in working capacity. The maximum utilization of hay was obtained when restricted to from 6 to 8 kg. per head daily. It is pointed out that draft horses could be maintained on other mixed fodders without hay for long periods provided their nutritive requirements were fulfilled. The small amount of protein required by draft horses indicates that timothy hay and grasses should be used for horses, while the legumes would be more efficiently used by cows.

Effects of feeding extremely wide rations to horses, B. A. DUNBAR (*South Dakota Sta. Bul. 212 (1925), pp. 3–30, figs. 11*).—The results of investigations of the effect of feeding oat straw as the sole winter ration to horses are reported.

Three horses were selected for the tests, which were conducted from 1912 to 1916, inclusive. The experimental animals were allowed full feeds of the straw, and in addition salt was available. The feeding periods in the different years varied from 90 to 120 days in length. Between test periods the animals were allowed to run idle and feed as the other horses on the station farm, thus allowing for a long recuperation period. The digestibility of the ration was determined in two 5-day tests in 1912 and in one such test in each of the succeeding years. At the end of each 10-day period during the experimental feeding, 24-hour samples of the feces were collected for analysis. The animals were measured from time to time and weighed at approximately 10-day intervals. Blood counts were also made as an aid in determining the condition. One horse died near the close of the 1913 feeding period and the other two were killed after the completion of the experiments. Post-mortem examinations were made of all animals.

The observations during the tests indicated that for a short time (30 to 40 days) after the beginning of each winter feeding period the animals improved physically. Following this improvement there was a marked reaction. The horses finally became emaciated and in very bad condition toward the end of the periods. A steady loss of weight was evident from the beginning to the end of the test. Lameness developed and the autopsies revealed the presence of eroded areas on the joint surfaces. The numbers of red corpuscles decreased and the leucocytes increased as the winter feeding progressed. The ability to digest the nutrients decreased as the oat straw feeding periods were continued, except in case of the ability to digest fats. A constantly larger bulk of feed was evidently eaten by the animals in an effort to supply sufficient nutrients for maintenance. Decreased vitality was apparent in each succeeding year, notwithstanding the long recuperation period between.

"The evidence seems to point out the evil effects to be expected from a custom . . . of allowing horses to have access to straw only during several months of the year, especially during those months wherein the animals are in comparative idleness."

[Experiments with poultry at the Morden, Man., Experimental Station], W. R. LESLIE (*Canada Expt. Farms, Morden (Man.) Sta. Rpt. Supt. 1923, pp. 40–45, fig. 1*).—The results of the following experiments are briefly reported:

Breeding for egg production.—Three years of breeding for egg production has shown a distinct improvement among the best Rhode Island Reds and Barred Rocks hatched in succeeding years. The average number of eggs laid per bird among the Barred Rocks was 165.7 during 1921, 186 during 1922, and 205.9 during 1923. The average numbers laid by the best Rhode Island Reds in the same years were 105.3, 165.5, and 170.8.

Incubation.—In a comparison of incubators, 51 per cent of the fertile eggs were hatched in a hot water machine, as compared with 60 per cent in a hot air machine. A comparison of the hatchability of hens' and pullets' eggs showed that 84 per cent of the hens' eggs and 90 per cent of the pullets' eggs were fertile, of which 55 and 50 per cent hatched respectively. In a comparison of different breeds 57 per cent of the fertile Barred Rock eggs hatched, but only 47 per cent of the fertile Rhode Island Red eggs. Eggs laid during March, April, and May were from 85 to 86 per cent fertile, and 54 per cent of the fertile March and April eggs hatched, while 51 per cent of the May eggs hatched.

Rations for crate fattening.—Three rations were compared for crate fattening birds during a 21-day experiment. All feeds were mixed with buttermilk to the consistency of porridge. Lot 1 received equal parts of corn meal, oat flour, and shorts; lot 2 received equal parts of corn meal, low grade wheat flour, and shorts; and lot 3 received equal parts of oat flour, crushed wheat, and crushed barley. The average gains made during the experiment were in lot 1, 14.6 oz.; in lot 2, 1 lb. 5.3 oz.; and in lot 3, 1 lb. The average cost per bird for fattening was approximately 14 cts. in each lot.

Yard v. crate fattening.—In a comparison of yard and crate fattening for Rhode Island Red cockerels, two lots of 20 birds each were selected. Lot 1 was allowed the liberty of the pen with a small yard, while lot 2 was confined to fattening crates. The experiment lasted 21 days. The ration consisted of equal parts of corn meal, shorts, oat and barley chop, and one-half part low grade wheat flour mixed with buttermilk to make a thin porridge. The birds fattened in the yard made an average gain of 1 lb. 1.6 oz., while those fattened in crates made an average gain of 1 lb. 3.2 oz. and consumed an average of 5 lbs. 11 oz. of feed as compared with 6 lbs. by the yard-fattened birds.

[Experiments with poultry at the Scott, Sask., Experimental Station], M. J. Tinline (*Canada Expt. Farms, Scott (Sask.) Sta. Rpt. Supt. 1923, pp. 53–58, fig. 1*).—The results of experiments conducted are briefly noted, as follows:

Temperature in poultry houses.—Comparisons of winter temperatures in poultry houses indicated that the temperature within a large permanent poultry house was less influenced by sudden changes than the temperature in portable poultry houses.

Influence of date of hatching on egg production.—In a comparison of the egg production of pullets hatched in different seasons of the year, the following annual production per bird was obtained: For birds hatched early in April 159, late in April 173, May 135, and early June 129 eggs.

Beef scrap and milk for egg production.—A 90-day comparison of the value of adding beef scrap and milk to rations for egg production was conducted during the winter, using three lots of 26 Barred Rock pullets each. A lot receiving the basal ration only, without beef scrap or milk, laid an average of 10 eggs as compared with 17 eggs for another lot receiving beef scrap and 19 eggs for a third lot receiving milk. It is pointed out that the birds receiving no animal protein used more mash and less oyster shell and grit than the others. Eggs were produced at a less cost from the pen receiving skim milk.

Commercial v. home prepared mash.—The egg production of birds receiving a home-mixed mash was 50 per cent greater than of similar birds receiving a commercial mash.

Incubators and natural method of incubation.—Several incubators were compared as to their efficiency with the natural method of incubation. The eggs set varied in fertility from 81 to 87 per cent. The following hatching percentages were obtained for the fertile eggs in the different incubators: Buckeye 46, Prairie State 38, Tamlin 50, Queen 45, and hens 56.

Cost of fuel for incubators.—The amount of coal oil required for running incubators of different makes was calculated as follows per 100 eggs: Prairie State 9.2 lbs., Buckeye 12.2, Queen 16.9, and Tamlin 17.7 lbs.

Hens' v. pullets' eggs for incubation.—In comparing the fertility and hatchability of hens' and pullets' eggs, the hens' eggs were found to be 84 per cent fertile, of which 48.5 per cent hatched, while the pullets' eggs were 78 per cent fertile, and 56 per cent hatched.

Date of hatching.—The fertility and hatchability of eggs set during the different spring months were compared. March eggs were 69 per cent fertile, of which 47 per cent hatched; April eggs were 76 per cent fertile, of which 35 per cent hatched; while May eggs were 86 per cent fertile, of which 57 per cent hatched. It is noted that the low hatchability of April eggs may have been due to a lack of ventilation in the incubator room.

Cost of raising chicks hatched in incubators.—Based on the cost of oil for incubating and brooding and the cost of feeding from hatching to November 1, it was calculated that birds cost 35 cts. to raise, in addition to the cost of the eggs and the labor required.

Selecting laying hens, R. B. Thompson (*Arizona Sta. Timely Hints for Farmers, No. 152 (1925), pp. 8, figs. 2*).—A revision of the publication previously noted (E. S. R., 45, p. 776).

Artificial brooding, R. T. Parkhurst (*Idaho Sta. Bul. 139 (1925), pp. 20, figs. 9*).—Directions for the care, management, and feeding of brooder chicks, including the care and feeding of young pullets and cockerels and a brief account of diseases.

The poultry industry, M. A. Jull, A. R. Lee, H. Bunyea, R. R. Slocum, D. Jackson, S. W. Mendum, C. F. Langworthy, and W. L. McAtee (*U. S. Dept. Agr. Yearbook 1924, pp. 377–456, figs. 53*).—A description of the production and marketing of poultry and poultry products in the United States, including the prices of poultry products at different seasons.

DAIRY FARMING—DAIRYING

Energy requirements of dairy cows.—I, The quantities of nutritive energy necessary to maintain dairy cows in nutritive equilibrium, E. B. Meigs and H. T. Converse (*Jour. Dairy Sci., 8 (1925), No. 3, pp. 177–195, figs. 3*).—The feeding standards for milking cows as worked out by Haecker, Eckles, Armsby, Savage, Henry and Morrison, and others have been compared, and their application to the feed consumption, milk production, and maintenance of body weight by the cows in the U. S. Department of Agriculture herd at Beltsville, Md., has been studied both for cows on advanced registry test and for individuals under herd conditions.

It was found that the highly fed test cows required practically the same quantity of total digestible nutrients as were called for by the Savage standard, 8 per cent more net energy than that of the Eckles standard, and 17 per cent more net energy than by the Armsby standard. The cows under herd conditions required 2 per cent more total digestible nutrients than the Savage standard, 4.5 per cent more net energy than the Eckles standard, and 15 per cent more net energy than the Armsby standard. A comparison of the requirements of the Beltsville cows and the cows used by Eckles (E. S. R., 30, p. 773) showed that the Beltsville cows required 2.1 per cent more total digestible nutrients and 4.8 per cent more net energy than the Eckles individuals in order to maintain a uniform body weight. The constancy of the total digestible nutrient requirement for maintaining body weight in the two sets of data is pointed out. Similar agreement was obtained in comparisons with Haecker's results (E. S. R., 31, p. 670).

The authors conclude that "total digestible nutrients are a better index of the relative values of feeds for maintaining uniform body weight in dairy cows than are net energy values."

Soybeans for dairy cows, T. M. Olson (*South Dakota Sta. Bul. 215 (1925), pp. 15, figs. 2*).—The results are reported of two comparative tests of the value of ground soy beans and oil meal for milk production and one test in

which alfalfa hay and soy bean hay were compared. Each test consisted of three 30-day periods, with 10-day preliminary periods to each. Four cows were used in each test.

In the comparison of the oil meal and ground soy beans, the ration consisted of alfalfa hay, corn silage, ground corn, and ground oats in addition to the feeds tested. The ration was balanced by the Morrison feeding standard, according to production and body weight. Similar rations were employed for comparing the two types of hay, except that soy bean hay replaced the alfalfa hay during the second period and oil meal was fed throughout. The digestibility of the ratious was determined during the last five days of the second and third periods of each trial.

The results showed that the weights of the animals were apparently unaffected by the different rations. The total nutrients consumed by the different lots were very similar, but, due to the higher digestibility determined for the feeds during the first soy bean period, more digestible nutrients were consumed at that time. It was calculated from the results that the nutrients in 210 lbs. of ground soy beans produced 2,951.8 lbs. of milk and 120.33 lbs. of fat, while the total nutrients in 237.6 lbs. of oil meal produced 2,830.6 lbs. of milk and 118.67 lbs. of fat, also that 97 lbs. of ground soy beans were equivalent to 121 lbs. of old process oil meal for milk production and 116 lbs. of soy bean hay were equivalent to 123 lbs. of alfalfa hay. The ground soy beans proved equal in palatability to the oil meal.

Further tests of the effect of ground soy beans on the milk and fat production and the palatability of butter were also made. These tests indicated that ground soy beans temporarily increased the percentage of fat in the milk from certain cows. No softness of the butter was apparent when less than 50 per cent of the ration consisted of ground soy beans, but the iodine number increased as the amount of soy beans in the ration was increased.

The effect of cane molasses on the digestibility of a complete ration fed to dairy cows, P. S. Williams (*Jour. Dairy Sci., 8 (1925), No. 2, pp. 94–104*).—The effect of cane molasses on the digestibility of the total ration of dairy cows has been investigated at the Pennsylvania Experiment Station. Four Holstein cows were used in 3 experiments, each of which consisted of 3 trials of at least 10 days each with a 10-day preliminary period. A basal ration of corn meal, wheat bran, ground oats, linseed oil meal, peanut meal, gluten meal, and salt with hay and silage was fed during each trial. This ration was supplemented with 15 per cent cane molasses in the second and 25 per cent in the third trial of each experiment. The digestibility of the molasses was assumed in all experiments to be complete.

The digestion coefficients of the different nutrients showed much irregularity in the effect of the different amounts of molasses, with the different individuals, and in the different experiments. The average coefficients of digestibility are summarized in the following table:

Effect of molasses on digestibility of rations fed 4 cows (average of 3 trials)

Kind of ration	Dry matter	Crude protein	Ether extract	Crude fiber	Nitrogen-free extract
	Per cent	*Per cent*	*Per cent*	*Per cent*	*Per cent*
Basal	64.622	65.524	70.857	50.223	70.978
Basal plus 15 per cent molasses	61.358	61.461	60.529	51.816	71.624
Basal plus 25 per cent molasses	63.337	59.480	71.991	47.029	70.838

The author concludes that the digestibility of the crude fiber, nitrogen-free extract, and ether extract was not uniformly affected by the addition of the molasses, but that this feed tended to lower slightly the digestibility of the crude protein and dry matter.

Yeast as a supplementary feed for lactating cows, C. H. ECKLES and V. M. WILLIAMS (*Jour. Dairy Sci., 8 (1925), No. 2, pp. 89–93*).—In continuing the study of yeast as a feed for dairy cattle at the Minnesota Experiment Station (E. S. R., 53, p. 176), the milk production of two lots of four cows each, fed by the double reversal method on normal rations with and without supplements of 25 gm. of yeast per pound of milk produced, was compared. The experimental periods were 30 days in duration, in addition to 10-day transition periods. The normal ration consisted of alfalfa hay, corn silage, dried beet pulp, and a grain mixture of ground corn, ground oats, wheat bran, and linseed oil meal (2:2:2:1).

The results did not show any advantage for the yeast feeding. One group produced an average of 26.51 lbs. of milk and 0.942 lb. of fat per day during the second period on the basal ration, and 26.38 lbs. of milk and 0.957 lb. of fat as the average for the first and third periods with the yeast supplement. Very similar results were shown by the other group. No effect was observed of any action of the yeast on the condition of the animals or stimulation of their appetite.

Feeding the dairy cow, H. P. DAVIS (*Nebraska Sta. Circ. 29 (1925), pp. 5–29*).—General directions are given for the feeding of dairy cows, including summer feeding on pasture and with soiling crops, and the use of various roughages, succulent feeds, and grains for winter feeding.

Dairy calf care and management, H. P. DAVIS and R. F. MORGAN (*Nebraska Sta. Circ. 30 (1925), pp. 5–31, figs. 7*).—General directions for the care, management, and feeding of calves, young stock, and cows during pregnancy.

Calculating the average production of a dairy herd, R. B. BECKER (*Jour. Dairy Sci., 8 (1925), No. 2, pp. 105–114*).—Inaccuracies of the various methods of calculating the average milk and fat production of dairy herds are pointed out. Among the causes for such inaccuracy are the failure to consider the lengths of the lactation and dry periods and the effect of the cows' passing only a part of their lactation period in the herd. A new method is suggested for calculating herd averages. This method makes corrections for records of portions of the lactation period by first determining the average length of the complete lactation periods of cows in the herd and incorporating the portions of lactations on this basis. This method has been in use in Kansas for three years and has proved satisfactory.

Selection, breeding, methods, mean more milk, H. P. DAVIS (*Nebraska Sta. Circ. 31 (1925), pp. 8, figs. 7*).—A popular discussion.

Effect of age and development on butterfat production of register-of-merit Jersey and advanced-register Guernsey cattle, R. R. GRAVES and M. H. FOHRMAN (*U. S. Dept. Agr. Bul. 1352 (1925), pp. 24, fig. 1*).—Based on the 14,571 butterfat records of Jersey cows included in the class A and AA groups in the Register of Merit of Jersey cattle, prior to and including the 1921 volume, and the 8,602 butterfat records of Guernseys in the single-letter classes in the Herd Register of the American Guernsey Cattle Club, up to and including vol. 34, No. 6 (1922) the authors have studied the increases in butterfat production accompanying increased age and the effect of development and pregnancy on production.

The effect of age was determined by using the initial record only of each individual. These results indicated that Jerseys reach their maximum pro-

duction at approximately 6 years of age, and that this average production is maintained until after 10.5 years before any marked decline occurs. Guernseys appeared to reach maximum production at 5 years and maintained it until 11 years of age. The entry and reentry records of the Jerseys and Guernseys were tabulated in all combinations of ages for each, and after deducting the estimated amount of the increase due to age, the amount due to so-called development was found. This averaged 11 per cent for the Jerseys and 12.2 per cent for the Guernseys.

In studying the effect of pregnancy all ages of Jerseys except those under 2 years showed a somewhat higher average fat production for those in the A class as compared with those in the AA class. The average for the GG class in the Guernseys was also lower than for the single-letter class. The effect of pregnancy seemed to be more pronounced in older animals than in young ones. A chronological tabulation of Jersey records indicated that the average production for each age had increased during the last few years.

The effect of season on the milk and fat production of Jersey cows, C. E. Wylie (*Jour. Dairy Sci., 8 (1925), No. 2, pp. 127–131, figs. 2*).—More than 2,900 register of merit records of Jersey cows freshening during the year 1921 have been tabulated at the University of Tennessee for studying the average milk and fat production in the different months of lactation for cows calving in the different months of the year.

The results have shown that the yearly milk production was highest for cows freshening in July, October, November, December, January, February, and March. Cows freshening during April, May, June, August. and September were the lowest producers. The average fat percentage of the milk was highest for the year for cows freshening in July, September, and October. The highest yearly production of fat was made by cows calving in July, October, November, and December, while April, May, and August were the low months.

Inheritance of the per cent of fat in a Holstein herd, W. D. Burrington and G. C. White (*Jour. Dairy Sci., 8 (1925), No. 3, pp. 215–229, figs. 6*).—Data are cited from the Holstein herd at the Connecticut Storrs Experiment Station, which originated from 2 cows in 1903, to show that through the 5 generations of the offspring of one of the foundation animals and the 4 generations from the other the same general average fat percentage of the milk has been maintained, though the same bulls have been used on the two families. The milk of one of the foundation cows tested 3.46 per cent fat, and 15 female descendants were found to average 3.48, 3.66, 3.51, 3.47, and 3.46 per cent fat in the successive generations, respectively. The other foundation cow produced milk containing 3.25 per cent fat, and her 20 female descendants averaged 3.12, 3.23, 3.17. and 3.20 per cent fat in the successive generations, respectively. Only one cow in the high testing family produced milk containing less than 3.25 per cent, and only two in the low testing family produced milk testing over 3.46 per cent. These two individuals were daughters of a son of one of the cows from the high testing family.

Effect of various factors on the creaming ability of market milk, H. A. Whittaker, R. W. Archibald, L. Shere, and C. E. Clement (*U. S. Dept. Agr. Bul. 1344 (1925), pp. 24, fig. 1*).—The effect of various milk plant operations on the creaming ability of milk has been studied cooperatively by the Minnesota State Board of Health and the Bureau of Dairying. The investigations were conducted in the laboratory of the board, the division of dairy husbandry of the University of Minnesota, and at various commercial plants.

The creaming ability was determined as the number of cubic centimeters of cream rising in from 20 to 24 hours on 100 cc. of milk kept in a graduate.

The various processes studied as affecting the creaming ability include pasteurization at various temperatures of fresh and old milk, cooling and storage at different temperatures, age, recreaming, pumping, agitating, clarifying, and filtering.

Some variation was observed in the effect of the different methods of pasteurizing the milk, but practically no difference was apparent in milk pasteurized with an apparatus using a low temperature heating medium as compared with a high temperature medium, provided the time of heating was approximately the same. Slightly better creaming was obtained in vat pasteurization with a low temperature medium forced through the coils by a direct-acting pump, as compared with the ordinary circulation of a heating medium of higher temperature. Pasteurization for 30 minutes below 145° F. did not appear to decrease the cream volume appreciably, but at from 145 to 146° the volume was reduced approximately 8 per cent, and at 148° from 18.5 to 41.7 per cent. Pasteurization of old milk at 145 to 146° did not appear to reduce the creaming ability as much as that of fresh milk. Cooling in a tank or vat pasteurizer produced a decreased amount of cream, but when the milk was so cooled to 110 or 120°, followed by quick cooling to below 50° over a separate cooler, the cream volume was satisfactory. The necessity of cooling milk to a low temperature for the production of a good cream layer was also indicated, as well as storage at a low temperature. The recreaming of both raw and pasteurized milk exerted a detrimental effect on the cream volume, which was particularly pronounced in the pasteurized milk.

Pumping milk at temperatures between 60 and 120°, allowing milk to stand or to be agitated for 15 minutes or more at temperatures between 60 and 110°, and clarifying milk at temperatures above 80° tended to reduce the cream volume. Filtering hot milk had practically no effect on the cream.

It is pointed out that of the various steps in the milk plant, many may influence the creaming ability of milk to a marked extent, though the influence of the individual operations be small.

Treatment of cream for the removal of objectionable flavors and odors, O. F. Hunziker (*Jour. Dairy Sci., 8 (1925), No. 2, pp. 132–145*).—A method of removing volatile off-flavors from cream has been devised. The cream is standardized to a low acidity and pasteurized by the flash method. The hot cream is then sprayed into a partial vacuum, having a current of warm air blown through it. To avoid premature churning and the production of butter having a mealy texture, the cream should be kept in motion with rapid cooling and without excessive agitation.

The destruction of bacteria in the roller process of milk drying, R. F. Hunwicke and H. Jephcott (*Jour. Dairy Sci., 8 (1925), No. 3, pp. 206–214*).—Samples of milk sterilized by heating for one hour at 100° C. and inoculated with cultures of *Bacillus coli, B. cloacae, Sarcina lutea, Staphylococcus albus,* a long chain Streptococcus, and capsulated bacteria producing red pigment were found to be practically sterile after drying by the roller process. The only milk showing the presence of living bacteria after drying and reconstituting was one sample which originally contained 2,000,000,000 organisms per cubic centimeter and after drying contained 4 per cubic centimeter. Milk inoculated with the spore formers *B. mycoides* and *B. subtilis* showed a greater survival after drying.

In further experiments, samples of milk were inoculated with bovine and human tuberculous bacteria. The milk so treated caused characteristic lesions of tuberculosis in guinea pigs, but no lesions were produced when

guinea pigs were similarly inoculated with the reconstituted milk after it had been dried by the roller process.

The authors conclude that the roller process of producing milk powder practically destroys all nonspore-bearing bacteria.

Relation of water to milk borne typhoid, C. R. FELLERS and R. S DEARSTYNE (*Jour. Dairy Sci., 8 (1925), No. 2, pp. 146–167*).—The results of a number of tests of the longevity of bacteria of the typhoid group when dried on glass showed that these organisms could withstand such desiccation for from 8 hours to several days, and for periods up to from 7 to 10 days when a film of milk was present.

Bacterium typhi, *B. paratyphosum* A, and *B. shigae* were found to survive from 13 to 20 days in pure surface water, and for several months in mineral and salt waters when placed in the dark. *B. typhi* and *B. paratyphosum* A were destroyed in less than 4 days in surface water exposed to direct sunlight.

The wells and springs of 50 dairy farms were tested bacteriologically, and it was found that 38 contained members of the *B. coli* group. Only 21 contained fecal types of the group. Forty springs and wells in the same district but not from dairy farms were found to be polluted with colon types.

Bacteriological studies of milk bottles cleaned for use showed average counts for quarts of 692 per cubic centimeter when rinsed with a hypochlorite solution, 387,000 when washed in hot water, and 1,480 when treated with live steam. Similar results were obtained with pints. The possibility is pointed out of organisms of the typhoid group living long enough on dairy utensils for inoculation of the milk when they are present in the wash water.

VETERINARY MEDICINE

Textbook of comparative physiology of domestic mammals, W. ELLENBERGER and A. SCHEUNERT (*Lehrbuch der Vergleichenden Physiologie der Haussäugetiere. Berlin: Paul Parey, 1925, 3. ed., rev., pp. XII+643, figs. 423*).—This is a revised edition of the work previously noted (E. S. R., 45, p. 870).

The technique of microbiology and serology, A. CALMETTE, L. NÈGRE, and A. BOQUET (*Manuel Technique de Microbiologie et Sérologie. Paris: Masson & Co., 1925, pp. 568, pls. 3, figs. 14*).—This is a manual giving detailed information on technique.

Animal Diseases Research Association research laboratory report for 1924, S. H. GAIGER (*Anim. Diseases Research Assoc. [Edinburg] Research Lab. Rpt. 1924, pp. 27*).—This report gives an account of work with braxy, lamb dysentery, scrapie, trembling or louping-ill, "grass disease" in horses, streptococcic mammitis in cows, gangrenous mammitis in ewes ("udder-clap"), distemper in dogs, etc.

Veterinary research report [New South Wales], No. 1, H. R. SEDDON (*N. S. Wales Dept. Agr., Sci. Bul. 24 (1925), pp. 47*).—Following a brief Annual Report of the Director of Veterinary Research, for the Year 1923–24, by Seddon (pp. 5–13), accounts are given of *Stachys arvensis*, a Cause of Staggers or Shivers in Sheep, by Seddon (pp 14–27); the Poisoning of Stock by *Solanum sturtianum* F. v. M. (pp. 28–33), *Marsdenia rostrata*, a Vine Poisonous to Stock (pp. 34–43), and Suppurative Otitis in Swine (pp. 44, 45), all by Seddon and H. R. Carne; and the Treatment of Contagious Streptococcic Mastitis in Cows by Oral Administration of Formalin, by Seddon (pp. 46, 47).

Tests of the value of oral administration of formalin, as advocated by Frost (E. S. R., 37, p. 277) were made upon two cows, with disappointing

results. The author failed to substantiate the report of Frost that formalin is excreted through the milk and can be detected by suitable tests.

Report of the chief veterinary officer for the period of nine months ended 31st December, 1921, W. KENNEDY (*Kenya Colony Dept. Agr. Ann. Rpt. 1921, pp. 38–58*).—The occurrence of infectious diseases of livestock and control work therewith are reported upon.

Tissue culture: Studies in experimental morphology and general physiology of tissue cells in vitro, A. FISCHER (*Copenhagen: Levin & Munksgaard, 1925, pp. 310, pl. 1, figs. 70*).—Following introductory remarks (pp. 17, 18), the several chapters of this work deal with a historical review (pp. 19–33), culture media (pp. 34–79), technique for tissue cultivation (pp. 80–102), pure strains of tissue cells (pp. 103–141), tissue culture as a physiological and anatomical method (pp. 142–219), and tissue culture as a pathological method (pp. 220–271). A bibliography of 32 pages is included.

The loco weed and its effect on livestock, F. C. GATES (*Kansas Sta. Circ. 115 (1925), pp. 4, fig. 1*).—This is a brief practical account.

The piroplasms and piroplasmoses [trans. title], H. VELU (*Mém. Soc. Sci. Nat. Maroc, 2 [i. e. 3] (1922), pp. 285, figs. 32*).—The first part of this work (pp. 11–132) consists of a general account of piroplasms and the second part (pp. 133–259) of a report upon a special study made of the piroplasmoses. A bibliography (pp. 261–285) is included.

Contributions to the study of the animal parasites of Rumania (1898–1924), N. LEON (*Contributions à l'Étude de Parasites Animaux de Roumanie (1898–1924). Bucharest: Cultura Naţională, 1924, pp. 152, figs. 83*).—This is a collection of 33 articles by the author, dealing with insect parasites and helminths in Rumania.

Skin penetration by the infective larvae of Dochmoides stenocephala, T. GOODEY (*Jour. Helminthol., 3 (1925), No. 3–4, pp. 173–176*).—In addition to four species of hookworms previously demonstrated to be capable of penetrating intact skin, namely, *Ancylostoma duodenale*, *A. caninum*, *A. braziliense*, and *Necator americanus*, the author adds another common hookworm, that of the dog and fox, *D. stenocephala*, the mature ensheathed larvae of which are skin penetrators.

Studies on the metabolism of B. botulinus in various media, E. WAGNER, K. F. MEYER, and C. C. DOZIER (*Jour. Bact., 10 (1925), No. 4, pp. 321–412, figs. 12*).—This paper, which should be consulted in the original, consists of the detailed report of an extensive investigation of the metabolism of *Bacillus botulinus*, types A and B, in various media, and a discussion based on the data reported of the possible mechanism of toxin production. The authors favor the view that the toxin is formed in a manner similar to that suggested for diphtheria toxin by K. G. Dernby and L. E. Walbum,[3] who believe that the proteolytic enzymes of the bacilli are the main causative agents in the process of toxin formation.

Selective localization of Corynebacterium pseudotuberculosis (diptheroid bacillus of Preisz and Nocard) in experimentally infected guinea pigs, I. C. HALL (*Cornell Vet., 15 (1925), No. 3, pp. 315–325, figs. 3*).—The author calls attention to the failure of large intraperitoneal doses of *C. pseudotuberculosis* to produce orchitis, owing to the early death of the animals so treated, and the occurrence of multiple abscesses in the omentum, such as never occur in guinea pigs given small doses productive of orchitis.

Mercury injection treatment for gall-sickness and redwater, J. P. HAMILTON (*Rhodesia Agr. Jour., 22 (1925), No. 4, pp. 500–502*).—Successful results

[3] Biochem. Ztschr., 138 (1923), No. 4–6, pp. 505–560.

obtained during a period of three years from the use of intramuscular injections of a solution of mercury perchloride (corrosive sublimate) in the treatment of gall sickness (anaplasmosis) and redwater (piroplasmosis) in cattle are said to have convinced the author that this treatment gives a higher percentage of recoveries and is safer to use than any other treatment so far brought to his attention. Ten cc. of a 2 per cent solution of mercury perchloride is deeply injected into the muscular part of the shoulder or buttock. This is repeated in 12 hours, and again every 24 hours until the animal has had five treatments. To animals under 18 months of age 5 cc. doses of the solution are given, and to young calves under three months 3 cc. It is pointed out that the mercury injections are only recommended for the treatment of these diseases, and have no beneficial action as a preventive.

The application of the conglutination reaction to the serum diagnosis of bovine pleuro-pneumonia (lung-sickness), J. WALKER (*So. African Jour. Sci., 20 (1923), No. 2, pp. 406–431*).—The author finds that a specific complement-fixing body exists in the sera of cattle naturally infected with pleuropneumonia and in the sera of cattle which react to inoculation with pleuropneumonia virus. The conglutination test carried out according to the technique described is of value in the diagnosis of bovine pleuropneumonia. A positive reaction indicates a preexisting but not necessarily present infection. The specific complement-fixing body can be demonstrated in the case of some naturally infected cattle for a period of at least approximately 12 months after infection, and in cattle which react to inoculation for at least 7 months. Further tests are necessary to determine the longest period during which the complement-fixing body exists in both naturally infected and inoculated cattle.

A note on the cultivation of flagellates of the Trypanosoma theileri type from the blood of South African cattle, E. M. ROBINSON (*So. African Jour. Sci., 20 (1923), No. 2, pp. 432–436, pls. 2*).—The author records the cultivation of the crithidial forms of *T. theileri* in artificial media in South Africa.

Sheep losses in Colorado feedlots.—Study No. 2, Paratyphoid dysentery, I. E. NEWSOM and F. CROSS (*Colorado Sta. Bul. 302 (1925), pp. 18, fig. 1*).—This second study of sheep losses in Colorado feed lots (E. S. R., 47, p. 72) deals with an outbreak of dysentery, which, in the fall of 1923, involved over 30,000 lambs, with a loss of approximately 2,000. The authors succeeded in isolating an organism of the paratyphoid B group, Aertrycke type, the characteristics of which are described. In the course of the investigations the authors found it possible to reproduce the disease in normal lambs with the organism isolated. It was found that fasting is an important predisposing cause.

Demodex cysts and abscess of sheep [trans. title], AYNAUD (*Compt. Rend. Acad. Sci. [Paris], 181 (1925), No. 1, pp. 62–64*).—The author's observations have shown that Demodex mites can produce subcutaneous cysts and subcutaneous abscesses similar to those of caseous suppuration. Their action had previously been supposed to be limited to the production of lesions of the epidermis.

Treatment for navel ill, W. H. GIBSON (*Canada Expt. Farms, Indian Head (Sask.) Farm Rpt. Supt. 1924, pp. 4, 5*).—A brief summary of the results of control work from 1920 to 1924.

Tetrachlorethylene, a new anthelmintic for worms in dogs, M. C. HALL and J. E. SHILLINGER (*North Amer. Vet., 6 (1925), No. 9, pp. 41–52*).—In continuation of the account previously noted (E. S. R., 53, p. 585), the authors present the details of the investigational work conducted.

Bacillary white diarrhea, F. R. BEAUDETTE (*Poultry Sci., 4 (1925), No. 6, pp. 205–224*).—This is a review of the present status of knowledge of this disease, contributed by the New Jersey Experiment Stations.

A study of roup in the domesticated fowl from the standpoint of etiology, C. H. WEAVER and C. A. MITCHELL (*Poultry Sci., 4 (1924), No. 1, pp. 9–21, 24, 25, figs. 4*).—This is a report of investigations made by the Canadian Department of Agriculture, in which it was found that roup in the Canadian climate is a disease bearing a direct relationship to the seasonal condition. Locally it ranks first in relative importance to all other diseases. Its economic importance is due mainly to the loss in egg production, rather than to the waste of fowl flesh from deaths. An organism belonging to the pasteurella group was isolated in pure culture, and when inoculated into healthy fowl produced a disease indistinguishable from roup.

Avian tuberculosis, E. K. GLOVER (*North Amer. Vet., 6 (1925), No. 9, pp. 33–36*).—This account includes a report of cases of the different types of tuberculosis in birds from several flocks.

Studies in the control of avian coccidiosis, J. R. BEACH and J. C. CORL (*Poulty Sci., 4 (1925), No. 3, pp. 83–93*).—Experiments conducted by the authors in California have led to the following conclusions:

"The treatment of chicks visibly sick with coccidiosis by any method known at this time is of little value, but a considerable percentage of such chicks may recover if provided with warm, dry, clean quarters. Chicks do not become infected with coccidiosis by the consumption of fresh cecal contents containing the nonsporulated oocysts or merozoites. Chicks may be readily infected, however, by the consumption of droppings or other material containing sporulated oocysts. Dryness inhibits or prevents sporulation of oocysts outside the body of the chick, and at least 24 hours are required for this to occur under favorable conditions. These observations emphasize the importance of the maintenance of dryness and frequent removal of droppings from brooder houses in the prevention of coccidiosis.

"Liquor cresolis compositus appears to have the ability to prevent sporulation of oocysts and, therefore, should be a useful disinfectant for brooder houses. The majority of chicks that survive the first 10 days of an acute outbreak of coccidiosis may be expected to recover. Chicks that do survive are resistant to subsequent infection. The drugs and chemicals used, viz, hydrochloric acid, sulfocarbolate, mercuric-chloride compound, potassium dichromate, catechu, bismuth subnitrate, and ipecac, failed to exhibit any effectiveness against coccidiosis. The constant feeding of buttermilk with the diet otherwise restricted appears to be an effective means of controlling outbreaks of coccidiosis. Feeding sweet skim milk or a solution of condensed whey also appears to have considerable, although less marked, value."

Intestinal coccidiosis, F. R. BEAUDETTE (*Poultry Sci., 4 (1925), No. 3, pp. 94–101*).—This contribution from the New Jersey Experiment Stations gives a summarized account of avian coccidiosis.

Diseases of the ruffed grouse, A. O. GROSS (*Science, 62 (1925), No. 1594, pp. 55–57*).—During the course of life history studies in 1924 at Brunswick, Me., and Syracuse, N. Y., certain diseases of ruffed grouse came to the author's attention, a preliminary report of which is here presented. The parasites and diseases observed include the nematode worms *Dispharynx* sp. and *Ascaridia lineata*, pulmonary mycosis, and avian tuberculosis.

The use of vaccines in poultry diseases, L. D. BUSHNELL and J. W. PATTON (*Poultry Sci., 4 (1924–25), No. 2, pp. 64–73*).—A contribution from the Kansas

Experiment Station, in which the authors deal with the mode of action of vaccines and the results obtained in the use of vaccines in poultry husbandry, including field tests. In summarizing the account, the authors point out that it is not probable that a vaccine will be a success unless it conforms to strict standards: (1) It must be antigenic, (2) must protect a large percentage of the flock on one application, and (3) must be cheap enough to make its use in poultry practical from an economic standpoint. The authors are led to conclude that vaccination as ordinarily conducted with vaccines made in the ordinary manner will lead to very mediocre results. The vaccines prepared and used in poultry husbandry to-day are considered to be of limited value. The chief requirement for success of a vaccine is the high antigenic property of the organisms used in its preparation.

AGRICULTURAL ENGINEERING

The News-Record kink book (*New York: Engin. News-Rec., 1925, pp. 203+[3], figs. 114*).—This is a collection of practical suggestions for saving time and labor on civil engineering and construction work.

Interpretation of topographic and geologic maps, C. L. Dake and J. S. Brown (*New York and London: McGraw-Hill Book Co., 1925, pp. XI+355, figs. 52*).—This is a text on map interpretation, with special reference to the determination of geologic structure and topographic features.

Surface water supply of St. Lawrence River basin, 1922 (*U. S. Geol. Survey, Water-Supply Paper 544 (1925), pp. IV+140, pls. 2*).—This report, prepared in cooperation with the States of Wisconsin, Ohio, New York, and Vermont, presents the results of measurements of flow made on streams of this basin during the year ended September 30, 1922.

Surface water supply of Hudson Bay and upper Mississippi River basins, 1922 (*U. S. Geol. Survey, Water-Supply Paper 545 (1925), pp. V+197, pls. 2*).—This report, prepared in cooperation with the States of North Dakota, Minnesota, Wisconsin, Iowa, Illinois, and Missouri, presents the results of measurements of flow made on streams in these basins during the year ended September 30, 1922.

Surface water supply of western Gulf of Mexico basins, 1922 (*U. S. Geol. Survey, Water-Supply Paper 548 (1925), pp. IV+124, pls. 2*).—This report, prepared in cooperation with the State of Texas, presents the results of measurements of flow made on streams in these basins during the year ended September 30, 1922.

Supplemental report on water resources of California, P. Bailey (*Calif. Dept. Pub. Works, Div. Engin. and Irrig. Bul. 9 (1925), pp. 51, pls. 2, fig 1*).—This report describes an economic program of physical works for the importation of water into Tulare County for irrigation purposes.

Mole draining by direct haulage, T. Close (*Jour. Min. Agr [Gt. Brit.], 32 (1925), No. 4, pp. 303-306, pls. 5*).—This is a well-illustrated description of mole drainage by direct haulage in England.

Tile drainage of farm lands, L. G. Heimpel and F. G. North (*Quebec Dept. Agr. Bul. 89 (1925), pp. 63, figs. 49*).—A large amount of practical information on the planning and installation of tile drains is presented, which is based upon the available knowledge of soil hydraulics.

Highways and highway transportation, T. W. Allen, A. B. Fletcher, A. T. Goldbeck, E. W. James, J. G. McKay, H. R. Trumbower, and H. S. Fairbank (*U. S. Dept. Agr. Yearbook 1924, pp. 97-184, figs. 57*).—This report draws attention to important features in State and Federal aid road building, and includes a large amount of data on the present status of highways in the

United States, engineering tests and procedure, and the use of highways for transportation.

The present status of subgrade studies, A. C. Rose (*U. S. Dept. Agr., Public Roads, 6 (1925), No. 7, pp. 137–162, figs. 12*).—A review is presented of the progress of subgrade research.

It has been found that the quantity and character of the clay content of a soil in the United States seems in general to determine whether it will make a good or bad subgrade. The moisture equivalent percentage appears to be of critical value with reference to the bearing power of the subgrade soil. When wetted beyond this percentage the bearing power seems to fall off rapidly.

There are indications that the moisture content rarely exceeds the moisture equivalent percentage at a depth below the surface of the soil sufficient to be removed from the influence of surface water and other forms of free water. There are also indications that by proper subgrade design it may be possible to control the moisture content of a subgrade soil to a maximum value approximately equal to the moisture equivalent percentage.

Construction methods which may be used to overcome the effect of bad subgrade soils are enumerated as (1) the use of coarse-grained soils for building fills over heavy clay soils, (2) the use of side ditches of special design, (3) the use of tile drains beside but not under the pavement, (4) the use of a granular subbase, (5) thickening of the pavement, and (6) the addition of steel reinforcement.

Public roads, [September, 1925] (*U. S. Dept. Agr., Public Roads, 6 (1925), No. 7, pp. 137–164+[2], figs. 12*).—This number of this periodical contains data on motor vehicle registrations and revenue, etc., for the six months ended June 30, 1925, and the gasoline tax in the first six months of 1925, and the status of Federal-aid highway construction as of August 31, 1925, together with an article on The Present Status of Subgrade Studies, by A. C. Rose (see above), and an announcement of the issue of a bulletin by the Highway Research Board.

Earth structure mechanics from the soil physics standpoint, K. Terzaghi (*Erdbaumechanik auf Bodenphysikalischer Grundlage. Leipzig: Franz Deuticke, 1925, pp. XV+399, pl. 1, figs. 64*).—This is a manual of soil physics and mechanics, with particular reference to their engineering applications. It contains chapters on soil properties, soil friction, tenacity of soils, hydrodynamic tension phenomena, soil statics, and soil as a structural material. A large amount of tabular and graphic data is included.

Tests of Indian timbers in structural sizes, L. N. Seaman (*Forest Research Inst., Dehra Dun, Econ. Branch Proj. 2 (1925), pp. 16, pls. 5*).—Standard tests for structural timbers are outlined in detail, as formulated for the purpose of establishing correct ratios between the strength functions of small, clear specimens and the allowable working stresses in structural members made of Indian timbers.

The toxicity of petroleums, E. Bateman and C. Henningsen (*Amer. Wood Preservers' Assoc. Proc., 21 (1925), pp. 57–61*).—Studies conducted by the U. S. D. A. Forest Products Laboratory indicate that no petroleums thus far examined can be used alone as wood preservatives in places where fungus attack is severe. It is considered unlikely that any American petroleums can be used alone as wood preservatives, but they may be used as carriers for one or more toxic materials.

The energy requirement of agricultural localities and its influence on power systems [trans. title], W. Windel (*Elektrotech. Ztschr., 44 (1923), No. 27, pp. 633–636*).—Certain statistical estimates are given in connection with the rural transmission schemes which are common in certain parts of Germany,

for the purpose of showing how the figures which have been obtained from existing systems can be usefully applied to the needs of the future.

Economic rural distribution of electrical energy by galvanized-iron and copper lines with ground return [trans. title], G. VIEL (*Rev. Gén. Élect., 14 (1923), No. 8, pp. 253–259, figs. 6*).—The economics of power distribution for agricultural purposes where each consumer takes from 5 to 15 kw. are analyzed.

The use of single-phase current at 10,000 volts with galvanized iron overhead wire and earth return is advocated. It is shown that with a single-phase line about 4 mm. in diameter of galvanized iron wire at 10,000 volts and 15 km. in length, 10 kw. can be transmitted with 4 per cent loss. The cost of a 3-phase line with copper conduits would be more than twice as much for the same conditions.

Prices are given for larger distribution schemes, together with a calculation for voltage drop and losses. It is shown that the voltage drop for the same current is from 8 to 13 times as great in iron wires as in copper wires, a great deal of the drop being due to skin effect.

Tests to determine the potential gradient in the earth with a grounded return led to the conclusion that an earth return is quite safe if suitable earthing plates are used covered with from 10 to 12 cm. of coke or charcoal moistened with an electrolyte and placed from 2 to 4 meters below ground level. The plates should also be joined to the line by an insulated conductor, and their number should be increased where bad earth is encountered. The surface of the earth should be covered with materials that are poor conductors wherever the plates can not be buried deep enough, and such areas should be inclosed.

Tests on the inductive effect on telephone and telegraph wires showed that the induced currents were too small to have any disturbing effect. For low tension distribution it is considered preferable to have a metallic return, as an earth return would have too much resistance.

Electric power in agriculture, C. D. WHETHAM (*Jour. Roy. Agr. Soc. England, 85 (1924), pp. 246–270*).—This is a brief survey of the present status of the subject in England. It is concluded that further progress lies in developing new or already known uses for electric power on farms, and in improving existing generating plants and adapting them to small-scale rural use.

Oil flow in complete journal bearings, D. P. BARNARD, IV (*Jour. Soc. Automotive Engin., 17 (1925), No. 2, pp. 205–209, figs. 9*).—General laws governing the rate of flow of oil through complete journal bearings are developed, which are based on the assumption that axial flow is a function of the bearing load. It is shown that a complete journal bearing can be considered as an oil pump, in which the pressure developed is utilized to support the imposed load and to induce a flow of oil through the bearing.

The volumetic efficiency of a bearing as a pump is a function of the factors governing bearing operation, grouped in the dimensionless order viscosity times rubbing speed divided by bearing load, length divided by clearance, and length divided by diameter. The first of these aparently exerts a predominating influence.

Oil feed pressure was found to increase the total flow through a bearing by an amount proportional to the feed pressure. The rate of heat generation increases approximately as the square of the speed and oil flow as some power less than the first. Unless heat dissipation by metallic conduction is very efficient, the temperature rise in a bearing will increase at a rate greater than the first power of the speed.

Plows and plowing.—II, A study of some typical Filipino native plows, A. L. TEODORO (*Philippine Agr., 14 (1925), No. 3, pp. 135–142, pl. 1, figs. 2*).—A description is given of the mechanism and construction of the various parts

of different native plows, and the action of these parts is briefly analyzed with reference to quality of work and of draft in the act of plowing.

While the implements investigated are apparently quite primitive, it is stated that native farmers find them to be very simple in construction, very light, and easy to manipulate. They can also be used conveniently to plow out corners of small fields. The general purpose plow is designed to break up the surface of the soil in first plowing rather than to pulverize it, and it is necessary to plow at least twice before a mellow seed bed can be produced. All the parts composing the plow, aside from the moldboard and share, are made of wood, which presents the advantage that the wooden parts either break or spring back to their original positions when subjected to stress.

Binder and knotter troubles, J. MacG. Smith (*Alberta Univ., Col. Agr. Bul. 10 (1925), pp. 49, figs. 45*).—The binding and knotting mechanism of grain binders is described, and problems attending their operation are outlined. Information on proper adjustment to avoid difficulties is included.

Machines for coating seed wheat with copper carbonate dust, A. H. Hoffman and H. L. Belton (*California Sta. Bul. 391 (1925), pp. 3–16, figs. 14*).—Machines for coating seed wheat with copper carbonate dust are described and illustrated.

The efficiency of a short-type refrigerator car, R. G. Hill, W. S. Graham, and R. C. Wright (*U. S. Dept. Agr. Bul. 1353 (1925), pp. 28, figs. 11*).—Three tests of a short type of refrigerator car are reported which showed that a very heavy load detracts from the efficiency of a car. This type of car will effectively refrigerate a load of 294 or 315 crates of celery. A load of 336 crates placed 8 crates wide and 3 layers high in 14 stacks retards the air circulation within the car, thus preventing efficient refrigeration of the load.

The adobe sweet potato storage house in Arizona, F. J. Crider and D. W. Albert (*Arizona Sta. Bul. 106 (1925), pp. 393–410, figs. 15*).—Practical information on the planning and construction of the adobe sweet potato storage house for use in Arizona is presented, together with information on preparing the storage house for use, harvesting and handling the potatoes, and management of the storage house.

RURAL ECONOMICS AND SOCIOLOGY

The economics of agriculture with special reference to the lag between expenditure and receipts, C. D. Whetham (*Jour. Roy. Agr. Soc. England, 85 (1924), pp. 122–159, figs 4*).—The lag of receipts behind expenditures is held to make necessary a large working capital and to make agriculture particularly liable to loss in times of falling prices. The author here calculates the variation in the normal receipts and costs of production for representative types of farming as prices rose and fell during the years 1914 to 1924, and traces the effect of the economic lag on the trading account of a representative arable farm and a dairy farm.

In the first instance a normal economic lag of 13.8 months is shown. That for the dairy farm in Dorsetshire was found to be 7 months. There follows a discussion of the relative national importance of arable and grass farming in England, wherein the latter is shown to have advantages in the way of giving a higher value of output per man employed. Arable farming, on the other hand, employs more men.

Average pre-war and post-war farm costs of wheat production in the North American spring-wheat belt, M. K. Bennett and J. S. Davis (*Food Research Inst. [Stanford Univ.] Wheat Studies, 1 (1925), No. 6, pp. 173–207*).—This study consists of a summary and interpretation of the available data on

the farm cost of producing wheat in the spring wheat belt of the United States and Canada, including the States of Minnesota, North and South Dakota, and Montana, and the Canadian Provinces of Manitoba, Saskatchewan, and Alberta. It covers the pre-war period 1908–1914 and the post-war period 1921–1924.

The seven official cost investigations upon which it is based are thought to have brought out the influence of yields on costs per acre, the effect of summer fallowing, and the significance of computing land charges on a cash rental as compared to other bases. Comparisons of costs, excluding land charges in the pre-war period, show wide variations in the different areas. No consistent relationship was observable between per acre and per bushel costs. The different factors affecting costs have been of unequal effect on costs in each area and have worked in different directions. The rank of areas in cost changed strikingly between periods. Costs per bushel excluding land charges ranged from 81.5 cts. in Saskatchewan to 97.7 cts. in North Dakota, but costs per bushel, including land charges, ranged only from $1.08 to $1.20 in the same areas.

The general impression that Canadian spring wheat growers are able consistently to produce at materially lower costs per bushel than American farmers is held to be not well founded. The prevalence of the practice of summer fallowing in Canada raises not only land charges per acre but labor and material charges as well. It is contended that a wheat tariff based on differences between costs of production in Canada and the United States is neither scientific nor practical. The assumption underlying the present duty of the existence of a normal or semipermanent difference in production costs is held to be improper.

Finally, the conclusion is reached that the analysis of the best cost statistics obtainable on wheat in the spring wheat belt throws no great light upon fundamental economic problems. Cost statistics, particularly those applicable to crops whose yield is variable, are exceedingly unstable. Their value in diagnosing agricultural prosperity or in providing a sound basis for price-regulating legislation is slight, and negative deductions from them outnumber positive ones.

Average pre-war and post-war farm costs of wheat production in the North American spring-wheat belt: Processes of adjustment and computation, M. K. BENNETT (*Food Research Inst. [Stanford Univ.] Wheat Studies, 1 (1925), No. 6, Sup., pp. 46*).—This is a mimeographed supplement to the study noted above. It deals with the processes of adjusting official data to secure comparability in farm costs excluding land charges, and discusses the accuracy of the adjusted statistics and the calculation and accuracy of average post-war land charges per acre.

Successful farming on 160-acre farms in central Indiana, L. ROBERTSON and H. W. HAWTHORNE (*U. S. Dept. Agr., Farmers' Bul. 1463 (1925), pp. II+30, figs. 20*).—This publication points out the systems of farming and some of the more important practices followed on successful 160-acre farms in contrast to those on less successful ones. The discussion is based on the results from all of the 160-acre farms in central Indiana from which records have been obtained and is frequently illustrated with facts from the four most successful and the four least successful 160-acre farms in the Clinton County area. Records of the year's business on 400 farms from 1910 to 1922 show that the best 10 per cent of the 160-acre farmers have made an average yearly income sufficient to cover 5 per cent on their capital and $1,465 for their labor and management, and in addition have obtained from the farm an important

share of the family living in the way of milk, meat, poultry, eggs, vegetables, fruit, fuel, and house rent, the value of which at farm prices was $605.

The economics of production on grass and arable farms, H. J. VAUGHAN (*Jour. Roy. Agr. Soc. England, 85 (1924), pp. 205–246, figs. 2*).—With certain exceptions practically every farm of importance in districts on the borders of Northamptonshire, Warwickshire, and Leicestershire, England, near Rugby and Market Harborough, and in a district extending from Witney and Buford to beyond the Cherwell Valley was surveyed. Detailed information was obtained as to the management of these farms in 1922–23. A general description of the regions and a detailed account of the farm organization and practices are presented, comparing these two areas as representative of grass and arable farming, respectively.

Report on the cost of production of maize investigation for the season 1921–22, E. PARISH (*[Union So. Africa] Dept. Agr., Sci. Bul. 33 (1924), pp. 46, figs. 7*).—A combination of questionnaire survey and detailed cost accounting methods was used in this investigation, which resulted in the taking of 39 usable records from the Transvaal, Orange Free State, and Natal in South Africa. Methods of corn production are described, and costs per bag, yields, and cost per acre are arrayed and plotted. The average, minimum, and maximum investments in certain cost factors and other items affecting cost of production are presented.

On none of the farms under investigation was a high yield obtained at too great a cost. On the contrary, those farms on which a yield appreciably above the average was obtained produced at a cost per bag which allowed a reasonable profit. In only three of the cases studied could the low yield be attributed to the weather.

Farm credit, farm insurance, and farm taxation, N. A. OLSEN, C. O. BRANNEN, G. F. CADISCH, and R. W. NEWTON (*U. S. Dept. Agr. Yearbook 1924, pp. 185–284, figs. 66*).—Farm credit is considered under the three main classes of long-term, short-term, and intermediate credit. The sources and terms and conditions of loans are set forth statistically and graphically. Farmers' fire, windstorm, livestock, crop, hail, and life-insurance problems and the existing means of meeting the needs in this respect are briefly discussed. The amount of property tax paid by farmers and the relation between farm earnings and taxes are set forth.

The present scheme of real-estate taxation is found to have been frequently unduly heavy and unjust and has been continued unmodified partly because of its simplicity and partly because of expediency.

Livestock financing: A selected list of references . . ., compiled by K. JACOBS (*U. S. Dept. Agr., Bur. Agr. Econ., Agr. Econ. Bibliog. 7 (1925), pp. [2]+28*).—In this mimeographed bibliography 168 selected references are listed under the headings of general studies; loans by banks; cattle loan companies, commission firms, and agricultural credit corporations; stock growers' finance corporation; and governmental agencies.

A brief survey of rural credit, J. B. CONDLIFFE and H. BELSHAW (*New Zeal. Jour. Sci. and Technol., 7 (1925), No. 6, pp. 334–352*).—Attention is directed to the complexity of the demand for capital in the farm business. Existing facilities for obtaining credit in New Zealand through both Government and commercial agencies are noted, and an estimate is made of the present economic situation, with particular reference to prices of agricultural products and mortgage operations.

The taxation of unimproved value of land in Australia, H. HEATON (*Quart. Jour. Econ., 39 (1925), No. 3, pp. 410–449*).—Between 1884 and 1910 the separate States of Australia imposed taxes upon unimproved land in order to

obtain revenue, secure for the community some of the unearned increment, and by breaking up the big estates make available for colonization the idle or under-utilized land. An account is given of the litigation resulting from efforts to assess and collect the Federal tax of 1910. The problems which arose in connection with land valuation are discussed.

It is held that this tax had the effect of bringing about a redistribution of the land. Many of the large landholders reduced the area and value of their holdings by selling the land with a high unimproved value. Areas were divided into small blocks and sold on easy terms and at satisfactory prices.

The author questions somewhat the advisability of further development of close settlement at the present time.

How the farmer can verify his income taxes, A. Sauzède (*Comment l'Agriculteur Peut Vérifier Sa Feuille d'Impôts sur les Revenus. Paris: Libr. Agr. Maison Rustique,* [*1925*], *pp.* [*1*]+*40*).—Detailed instructions are given for the French farmer, and a rather complete commentary is presented covering regulations with reference to definitions, declarations, deductions, and other matters of tax assessment.

Crops and Markets, [**September, 1925**] (*U. S. Dept. Agr., Crops and Markets, 4* (*1925*), *Nos. 10, pp. 145–160; 11, pp. 161–176; 12, pp. 177–192; 13, pp. 193–208*).—The usual notes on market conditions and market supply and price data for the current week, with comparisons and summaries, are given in these numbers for the important classes of agricultural commodities. Brief notes are also presented with reference to foreign crops and markets.

Monthly Supplement to Crops and Markets, [**September, 1925**] (*U. S. Dept. Agr., Crops and Markets, 2* (*1925*), *Sup. 9, pp. 281–312, figs. 4*).—Special articles setting forth the monthly money income of farmers, 1919–1925, the movement of sheep and lambs from range States, stocks of cattle on western ranches, and farmers' intentions to sow winter wheat and rye are features of this issue. Numerous crop condition reports and the usual tabulations of estimated prices received by producers, receipts and disposition of livestock at public stockyards, livestock and meat and milk market statistics, cold storage holdings, shipments of fruits and vegetables, and other data are also given.

Farms and markets law, 1925 (*N. Y. State Dept. Farms and Markets, Agr. Bul. 178* (*1925*), *pp. 223*).—The New York State law pertaining to the production and marketing of food is given with amendments passed by the legislatures of 1922 to 1925, inclusive.

Egg exchanges, E. W. Benjamin (*Poultry Sci., 4* (*1925*), *No. 5, pp. 171–178*).—Certain typical exchanges for marketing eggs, as well as those dealing in other agricultural commodities, are briefly described. Such exchanges are deemed helpful in making transfers of food products easier, and the author urges practical market experience for a teacher of any marketing subject.

Growth and organisation of the Canadian grain trade, E. H. Godfrey (*Jour. Roy. Agr. Soc. England, 85* (*1924*), *pp. 1–32, pls. 7*).—The author describes grain production in western Canada, setting forth also legislation and regulation of grain grading and marketing, the system of grain elevators, terminal marketing, and the flour and milling industry.

Report on co-operative marketing of agricultural produce in England and Wales, R. J. Thompson ([*Gt. Brit.*] *Min. Agr. and Fisheries, Econ. Ser. 1* (*1925*), *pp. 195, pl. 1, figs. 6*).—This is a report upon what is deemed a somewhat exhaustive investigation into the present position and methods of cooperative societies engaged in the sale of agricultural products. The historical background is outlined first, and subsequent sections of the report are concerned with milk and dairy produce societies, egg and poultry societies, fruit

and vegetable societies, cooperative livestock trading, cooperative slaughter houses, cooperative bacon factories, cooperative wool marketing, the cooperative marketing of grain, fodder, seeds, etc., federation for trading purposes, the industrial cooperative movement in relation to agricultural cooperation, and some fundamental issues.

Possibilities and limitations of cooperative marketing, H. E. Erdman (*California Sta. Circ. 298 (1925), pp. 19*).—An article previously noted (E. S. R., 53, p. 289) is revised and enlarged. Specific possibilities and limitations are discussed. Three limitations which are set out particularly are that cooperative associations can not arbitrarily fix prices, although they can and do exercise a favorable influence on them. Cooperative organizations can not eliminate the middleman except in the sense of combining the function performed by a number of dealers at any given stage in the marketing process. Cooperative marketing can not operate a given business unit any more cheaply than a private concern could operate the same unit.

What makes the price of oats, H. B. Killough (*U. S. Dept. Agr. Bul. 1351 (1925), pp. 40, figs. 8*).—It is pointed out that the oat crop is grown and consumed almost entirely within the United States, for which this study is made, also that a single annual supply of this crop becomes available for market within a short period of the year. It is assumed, therefore, that it may be treated in a price analysis by assuming a normal annual price, the problem being to discover the factors which determine this annual price and to measure their influence.

This study defines these factors as production and the area of the oat market, the trend of prices of oats, the values of large and small crops, the stabilizing influence of cooperative marketing, and certain others, including changes in the general price level, the year-to-year carry over of oats, substitute crops such as corn, and production of oats in Canada.

The seasonal movement of prices during the year is also analyzed, and two indicators of the volume of production which anticipates harvest, namely, the price of September futures and the monthly condition of the crop, are compared from the point of view of their relative accuracy in predicting future prices. Statistical methods used in the study of oat prices are applied also to wheat, in order to emphasize the difference in the method of treatment necessary for this crop.

The stabilization of the price of wheat during the war and its effect upon the returns to the producer, F. M. Surface (*Washington: U. S. Grain Corp., 1925, pp. 100, figs. 24*).—This is a preliminary report in which is incorporated hitherto unpublished material taken from the records of the war organizations concerned with the determination of a fair price for wheat. The wheat situation in the United States and in the allied countries at the time of the passage of the Food Control Act and the history of the control of grain prices during and immediately after the war are reviewed. Statistical data are tabulated and graphically presented, with interpretive comments in appendixes.

European wheat production as affecting import requirements, W. B. Stewart (*Food Research Inst. [Stanford Univ.] Wheat Studies, 1 (1925), No. 7, pp. 209–215*).—The variability of consumption of wheat in the importing countries of Europe which are also large producers and the tendency of consumption to vary with production in these countries are set forth. It is suggested that authoritative estimates of imports have given too little weight to this tendency.

The miller's margin, A. W. Ashby (*Jour. Roy. Agr. Soc. England, 85 (1924), pp. 109–121*).—Comparisons are drawn between prices of wheat, flour,

and bread in Great Britain, and consideration is given to the yield of flour from gross weights of wheat, blends, and variations in prices of flour.

History of agriculture in the northern United States, 1620–1860, P. W. BIDWELL and J. I. FALCONER (*Carnegie Inst. Wash. Pub. 358 (1925), pp. XII+512, pls. 6, figs. 106*).—This is the fifth in a series of contributions to American economic history being published by the department of economics and sociology of the Carnegie Institution of Washington. It represents the work of a number of collaborators. The parts of which it is composed are concerned with agriculture in the earliest settlements, rural economy in the eighteenth century, expansion and progress, 1800–1840, and the period of transformation, 1840–1860. A classified and critical bibliography (pp. 454–473), an alphabetical index of authors (pp. 474–492), and a statistical appendix (pp. 493–505) conclude the volume.

Colorado's agriculture, R. MCCANN and T. H. SUMMERS (*Fort Collins: Colo. Agr. Col., Ext. Serv. [1924], pp. 59, figs. 36*).—The information with reference to the physical and economic conditions of crop and livestock production and distribution in Colorado deemed important to the future development of agriculture has been compiled as a basis of a State agricultural program.

The agrarian movement in North Dakota, P. R. FOSSUM (*Johns Hopkins Univ. Studies, 43 (1925), No. 1, pp. VII+9–183, figs. 14*).—The author traces the early agrarian movement in the State, from about 1889 to 1895, and the cooperative elevator movement, which had its development between 1896 and 1915, and sets forth the history, aims, and outcome of the Nonpartisan League. It is held that recent changes in farming systems, with the introduction of more corn and potatoes and livestock and the industrialization of agriculture in this region, are gradually eliminating the causes for agrarian discontent. Appendixes embody some statistical material, reports, and public documents.

A five year program for the development of Virginia's agriculture (*Blacksburg: Va. Agr. Col., Ext. Div., 1924, pp. 103, figs. 23*).—The Virginia Agricultural Advisory Council, organized in August, 1922, is composed of one representative of each of the organizations and institutions in the State interested in its agricultural development. Its object is to better conditions on the farms and in the homes of the State by a closer cooperation of all agricultural organizations and institutions. Eleven subject-matter subcommittees make reports in these pages with reference to the improvement of particular lines of agricultural production.

[Agricultural history of South Africa], M. H. DE KOCK (In *Selected Subjects in the Economic History of South Africa. Cape Town: Juta & Co., 1924, pp. 44–56, 150–237*).—Chapters in a textbook on the economic history of South Africa are devoted to the development of agricultural and pastoral resources under the administration of the Dutch East India Company (1652–1795), as well as to land tenure and public land policy and the agricultural and pastoral industry of South Africa since the first British occupation.

Agriculture and the unemployed, W. WRIGHT and A. J. PENTY (*London: Labour Pub. Co., 1925, pp. 94*).—Four essays are published here on the theme that the industrialization of Great Britain has developed perhaps too far, that competition is keen for the world markets where formerly the surplus product of British manufactures was sold, and that, consequently, agriculture and food production at home rather than industry and foreign trade must be encouraged. Employment on the land at an adequate wage insuring a satisfactory standard of living would provide for the many who are now unemployed, and a considerable share of the nation's food supply could be produced.

The English agricultural laborer, 1300–1925, M. and T. B. FORDHAM (*London: Labour Pub. Co., 1925, pp. 63*).—This is a brief history covering the

period of old English country life 1300–1350, its break-up 1350–1509, changes in land holding and inclosures 1509–1830, the corn laws and various developments of the nineteenth century, and wages disputes and laborers' organizations in the twentieth century.

Living conditions of hop-pickers in Kent (*Jour. Min. Agr.* [*Gt. Brit.*], *32* (*1925*), *No. 3, pp. 219–223*).—A short account is given of the conditions prevailing during the hop-picking season in Kent, England. Suggestions are offered with reference to the improvement of housing conditions by providing large barracks or properly equipped encampments.

The rural home: Proceedings of the Sixth National Country Life Conference (*Natl. Country Life Conf. Proc., 6* (*1923*), *pp. IX+246, pl. 1, fig. 1*).—The following addresses or discussions comprise the report of the proceedings of the conference at St. Louis in 1923: The Place of the Home in the Farmers' Movement, by K. L. Butterfield; The Farm Home at Its Best, by R. G. Smith; Does the Present Business of Agriculture Make for a Permanent, Profitable, and Progressive Country Life? by J. R. Howard; Can the Farm Family Afford Modern Institutions? by C. J. Galpin; It Isn't Only Economic, by G. H. Von Tungeln; Is the Decline of the Country Doctor to Continue? by N. P. Colwell; Developing and Training the New Generation of the Farm Home—The Child before Its School Days by J. W. Abbot, Fitter Families by M. T. Watts, The Child at School by M. T. Harvey, The Boy and Girl of 'Teen-age on the Farm by N. T. Frame, Child Labor on the Farm by O. R. Lovejoy, and The Farm Parent by A. L. Binzel; Influences and Institutions That Affect the Home Life on the Farm—The Rural Church and the Farm Home by A. W. Taylor, The Rural School and the Farm Home by K. M. Cook, The Relation of the Press to the Home Life of the Farm by D. A. Wallace, and Public Welfare and Rural Adequacy by H. W. Odum; The Need of a New Element in Education, by W. H. Wilson; Suggestions as to the Contributions and Problems of the Father and Mother Necessary for the Maintenance of High Ideals in Home and Family Life, by I. Bevier; The Producer and Consumer in the Home, by W. H. Wilson; The Woman of the Countryside a Factor in National Affairs: A Symposium—For the League of Women Voters by L. S. Edwards, For the Council of Jewish Women by Mrs. H. J. Sporborg, For the Young Women's Christian Association by H. Roelofs, For the Farm Bureau by Mrs. W. C. Martin, and For National Congress of Mothers and Parent-teacher's Association by F. M. Hale; Home Demonstration Work: What Has It Done? What More Must It Do?—The National Viewpoint by G. E. Frysinger, The State Viewpoint by L. Bane and S. V. Powell, The Farm Girl's Viewpoint by J. A. Arnquist, and The Farm Woman's Viewpoint by Mrs. J. H. Dyer; The Jewish Farmer in the United States, by G. Davidson; The World Viewpoint of the Rural Home—The Rural Home in Japan by M. Masutomi, Sidelights on Danish Home Life by O. D. Campbell, and An International Review by K. L. Butterfield; A Thousand Nebraska Farm Families and Their Homes in Ten Survey Areas, by J. O. Rankin; Understanding the Farm Family, by W. Burr; Report of the Committee on Investigation, by C. J. Galpin; and Report of Committee on Religion and Morals, by P. L. Vogt.

[Yearbook statistics of crops, livestock production, and trade, and meteorological conditions] (*U. S. Dept. Agr. Yearbook 1924, pp. 559–1230*).—As noted for the earlier year (E. S. R., 51, p. 795), current statistics and summaries for the United States are presented with respect to specific crops and crop products, livestock and livestock products, forestry, and imports and exports of agricultural products. Miscellaneous agricultural statistics, including meteorological data noted elsewhere, are also given.

Agricultural statistics, 1924, R. J. Thompson (*[Gt. Brit.] Min. Agr. and Fisheries, Agr. Statis., 59 (1924), Nos. 1, pp. 55; 2, pp. 57–87; 3, pp. 89–147*).—These annual official reports continue the series previously noted (E. S. R., 52, p. 792).

Agricultural statistics for the year 1922 [for Bulgaria] [trans. title], K. G. Popov (Popoff) (*[Bulgaria] Dir. Gén. Statis., Statis. Agr., 1922, pp. [3]+93*).—Statistics showing the areas sown, yields, and other items are presented for the later year, continuing the series previously noted (E. S. R. 50, p. 795).

Report on the agricultural and pastoral production of the Union of South Africa, 1922–23 (*Union So. Africa Off. Census and Statis., Agr. Census No. 6 (1923), pp. XII+51*).—This report on the agricultural census taken August 31, 1923, continues a series of such reports in both English and Dutch previously noted (E. S. R., 49, p. 193).

AGRICULTURAL AND HOME ECONOMICS EDUCATION

List of technical workers in the United States Department of Agriculture, 1924–1925 (*U. S. Dept. Agr., Misc. Circ. 45 (1925), pp. II+91*).—Workers in Washington and in the field service are listed by bureaus, and an index of names is given.

Improving rural school instruction and supervision in Colorado (*Colo. Univ. Bul. 214 (1925), pp. 99, figs. 6*).—Part 1 of this study of village and rural schools is by J. H. Shriber, and sets forth the evils of the district rural school system and the advantages of organization on the county basis, particularly for the opportunity for supervision that it affords. Suggestions are offered for improving instruction and supervision under the present district system. Part 2 has been prepared by L. T. Hopkins and reports the results of standardized tests given in schools in Boulder County.

Agricultural education, research, and advisory work in England and Wales (In *The Year Book of the National Farmers' Union for 1925. London: Natl. Farmers' Union, 1925, pp. 65–81*).—Lists are given here of the county educational and advisory facilities in England and Wales, the principal activities of the provincial advisory centers, and the centers carrying on agricultural research.

Agricultural education [trans. title] (*Ann. Agr. Suisse, 26 (1925), No. 3, pp. 263–280*).—Theoretical and practical schools, winter schools, and schools for forestry, viticulture, and horticulture and for dairying are described in a portion of a report prepared on the occasion of the Ninth Exposition of Swiss Agriculture, Forestry, and Horticulture at Bern in 1925. Popular schools, traveling lecture courses, and other special means of disseminating agricultural information are noted. The enrollment in the schools and courses and the Federal subsidy received by them are tabulated for recent years and periods of years.

Report of the Italian Institute of Colonial Agriculture for 1922–23 and 1923–24 [trans. title], A. Ferrara (*Ist. Agr. Colon. Ital., Relaz. Attiv., 1922–23—1923–24, pp. 28*).—The activities of this organization for the improvement of agriculture in the Italian colonies include experimentation, service, and elementary education.

Lessons on cotton for elementary schools, F. A. Merrill (*U. S. Dept. Agr., Misc. Circ. 43 (1925), pp. 27, figs. 14*).—These outline plans of lessons for fall, winter, and spring terms are intended as aids in teaching the subject in seventh or eighth grades, particularly in rural consolidated schools. The problem is stated in each lesson, and sources of information, illustrative

material, topics for study, practical exercises, project work, and correlation with other school subjects are suggested.

Marketing of agricultural products, J. E. BOYLE (*New York and London: McGraw-Hill Book Co., 1925, pp. VIII+479, figs. 18*).—The author's aim is to set forth certain fundamental principles of marketing and to present programs for and achievements in putting them into practice. This textbook is divided into two parts on this basis, the first comprising 23 chapters devoted to demand, production, middlemen's functions, transportation, storage, credit, insurance, selling, auxiliary marketing functions, future trading, orderly marketing, and price, and describing the marketing of particular commodities. Part 2 deals with individual, cooperative, and governmental effort.

Groundwork of economics, R. MUKERJEE (*London, New York, and Bombay: Longmans, Green & Co., 1925, pp. VIII+217, pls. 8, figs. 5*).—In this textbook for Indian students of economics, Indian agriculture and village life receive the main emphasis. Consideration is given also to conditions affecting Indian labor, both agricultural and industrial, and the problems of small production and the decay of the small farming system in India in its social and economic implications.

Young farmers' clubs, G. G. ESSLEMONT (*Scot. Jour. Agr., 8 (1925), No. 4, pp. 415-419*).—The origin of this movement in the United States is recounted, as is also its history and development in Scotland.

Boys' and girls' 4–H club work, 1923, I. W. HILL and G. L. WARREN (*U. S. Dept. Agr., Dept. Circ. 348 (1925), pp. 47, figs. 16*).—Finances, personnel, and organization for club work are set forth, and methods and means of giving instruction and spreading influence are described. Results of club work during the year are reported under the heads of club demonstrations in field crops; horticulture; livestock; food production, preservation, and preparation; clothing; home management and beautification; and home industries.

The organization and direction of girls' 4–H clubs in food projects, G. R. ARMSTRONG and N. VASOLD (*Illinois Sta. Circ. 300 (1925), pp. 3–28, figs. 3*).—This circular has been prepared for local leaders of food clubs. The material is divided into three parts, (1) 4–H club organization, (2) suggestions for leaders, and (3) food projects. The first part contains the necessary detailed information for organizing the club group. The second part presents some of the problems frequently met in conducting a food club and offers suggestions for their solution. The third part gives the purpose, the minimum requirements, and suggested topics for discussion for the meal planning and preparation, bread, baking, and food preservation clubs.

School and home cooking, C. C. GREER (*Boston: Allyn & Bacon, 1925, rev. ed., pp. XXI+530+3–24, pl. 1, figs. 95*).—This is a revised edition of a textbook previously noted (E. S. R., 45, p. 93).

FOODS—HUMAN NUTRITION

The story of bread (*New York: Continental Baking Corp., 1925, pp. 69, pl. 1, figs. 45*).—Part 1 of this publication consists of a popular description, with many illustrations, of the history and development of modern methods of bread making from the growing of the wheat to the final distribution of the bread. In part 2 are assembled statistical tables on wheat crops, wheat flour prices, etc.

Home baking, C. CHATFIELD (*U. S. Dept. Agr., Farmers' Bul. 1450 (1925), pp. II+14*).—In this publication, which supersedes Farmers' Bulletin 1136 (E. S. R., 44, p. 761), emphasis is placed on the general principles of baking

as applied to soft wheat and hard wheat flours. A brief description is first given of the different types of wheat flour, of means of differentiating between strong and weak flours and the special uses of each, and of other flours and meals used in baking. The general principles involved in the making of yeast breads are then discussed, including the particular function of each of the ingredients and of the fermentation process and the successive steps in the straight dough method, using compressed yeast, and the sponge method, using dried yeast cakes, with adaptations of these methods to rolls, graham bread, and rye bread. Quick breads, cakes, cookies, and pastry are considered in the same way.

A few typical recipes are included, together with a table giving the relative proportions of liquid, flour, fat, eggs, baking powder, sugar, and salt for all types of quick breads, cakes, etc. In this table the quantities of flour recommended are for soft wheat or pastry flour, but simple rules are given for the substitution of other flours.

Principles of making fruit-jellies, N. E. Goldthwaite (*Colorado Sta. Bul. 298 (1925), pp. 5–27, figs. 7*).—This is chiefly a compilation from various publications of the author, particularly Principles of Jelly Making (E. S. R., 25, p. 62).

Home utilization of muscadine grapes, C. Dearing (*U. S. Dept. Agr., Farmers' Bul. 1454 (1925), pp. II+27, figs. 6*).—This publication combines and supersedes Farmers' Bulletins 758, 859, and 1033 (E. S. R., 35, p. 807; 38, p. 114; 40, p. 808).

Canning fruits, vegetables, and meats, D. A. Loudon and H. B. Spencer (*N. Dak. Agr. Col. Ext. Circ. 68 (1925), pp. 42, figs. 6*).—A useful manual on canning fruits, vegetables, and meats.

A complete course in canning (*Baltimore: Canning Trade, 1924, 5. ed., rev. and enl., pp. 377, figs. 13*).—This is a revision by A. W. Bitting of the volume previously noted (E. S. R., 42, p. 113). An introductory biographical sketch of Nicolas Appert, the founder of modern methods of canning, has been contributed by K. G. Bitting.

Home and farm food preservation, W. V. Cruess (*New York: Macmillan Co., 1925, rev. ed., pp. XXIV+270, figs. 61*).—A revision of the volume previously noted (E. S. R., 39, p. 614).

The phosphatide and total phosphorus content of woman's and cow's milk, A. F. Hess and F. D. Helman (*Jour. Biol. Chem. 64 (1925), No. 3, pp. 781–796*).—Data are reported on the content of phosphatides (lipoid phosphorus) and total phosphorus in several samples of human milk and cow's milk and in two samples of goat's and ass's milk. The phosphatides were extracted from the milk by a warm alcohol-ether solution, according to the method of Bloor (E. S. R., 32, p. 312), and the phosphorus was determined in the extract by the colorimetric method of Tisdall (E. S. R., 47, p. 13), modified slightly as to precipitating reagent by the use of 0.04 instead of 0.03 gm. of strychnine nitrate per 2 cc. and 5 instead of 8 drops of concentrated sulfuric acid.

The samples of human milk in the first two weeks of lactation gave much more irregular results as to phosphatide content than those of later periods. The range in the first group was from 1.48 to 4.08 mg. per 100 cc., and in the second from 2.09 to 2.96 mg. No reciprocal relationship appeared to exist between the phosphatide and total phosphorus content of the milk, nor was there any distinction in the phosphatide content of the milk of negro and white women.

The phosphatide content of cow's milk varied from 5.29 to 6.99 mg. per 100 cc. Two samples of cream containing 32 and 20 per cent of fat gave

values of 10.25 and 7.14 mg. of phosphatide, and two samples of skim milk containing 0.4 per cent of fat gave values of 4.12 and 4.44 mg., showing an inverse ratio of fat and phosphatide. This was also true of the total phosphorus. The range of phosphatide in the cow's milk was much higher than the values previously reported in the literature. This is attributed to the use of liquid instead of dried milk, and in proof of this data are given on the phosphatide content of a dried whole milk powder as determined on the original powder, on the powder after drying to constant weight at 100° C., and on liquid reconstituted milk prepared from the powder. The results obtained for the three portions were 2.47, 1.77, and 4.91 mg. of phosphatide per 100 cc.

The results for lipoid and total phosphorus for the two samples of goat's milk were 5.35 and 102.56 and 8.0 and 133.33 mg. per 100 cc., respectively, and for two samples of ass's milk 7.19 and 72.72 and 2.38 and 60.60 mg. per 100 cc.

The basal metabolism before, during, and after pregnancy, I. Sandiford and T. Wheeler (*Jour. Biol. Chem., 62 (1924), No. 2, pp. 329–352, figs. 8*).—Complete data are reported on the basal metabolism of a normal woman at intervals no longer than a week and sometimes daily from before conception to four months after the cessation of lactation and the reestablishment of menstruation, a total of 17 months.

The most significant point established by these data is that if allowance is made for the increase of protoplasmic tissue of the fetus there is no increase in heat production during pregnancy. The data also show no increase in heat production during lactation but rather a slight decrease, which is attributed to the less active life of the mother at this time. The basal metabolism after the reestablishment of menstruation showed slight fluctuations which could not be correlated with the menstrual cycle. This is in accord with the conclusions reported by Blunt and Dye (E. S. R., 46, p. 166).

Report on the nutrition of miners and their families, E. P. Cathcart et al. (*[Gt. Brit.] Med. Research Council Spec. Rpt. Ser. No. 87 (1924), pp. 59, figs. 4*).—This is a report of a dietary study conducted for a week on 140 families of coal miners in five districts in England. Some of the average weighted values obtained are as follows: Consumption of protein 74.17, fat 97.08, and carbohydrate 444.47 gm., and total calories 3,035 per man per day; the average percentage of total income spent for food 54.9 per cent and of total food money spent for bread and flour 18.4 per cent. Data are also given on the heights and weights for age of the boys and girls in the families studied and of the details of the diets in one of the counties.

Report of the departmental committee appointed to inquire into certain matters relating to the diet of patients in county and borough mental hospitals, R. W. Branthwaite et al. (*London: Govt., 1924, pp. 130, pls. 4, fig. 1*).—This report to the Ministry of Health of Great Britain of a committee on dietaries in mental hospitals includes a discussion of the present dietary conditions in insane asylums throughout England and of the food requirements of the insane and a proposed model dietary, with improvements in kitchen control and equipment. Various data, including the composition of the dietaries studied, anthropometric data and basal metabolism determinations on the insane, and other miscellaneous data, are given as appendixes.

The effect of pH on the oxygen consumption of tissues, A. E. Koehler and R. J. Reitzel (*Jour. Biol. Chem., 64 (1925), No. 3, pp. 739–751, fig. 1*).—Evidence is presented that the rate of oxygen consumption of minced tissue suspension (rabbit) "is a function of the hydrogen-ion concentration. The optimum pH was found to be in the vicinity of the normal reaction of the blood, pH 7.4 to 7.5. At pH values less than 4.5 and greater than 10, oxygen consumption is nearly completely depressed. Different tissues are affected in a

similar manner by changes in pH, but at the same pH various tissues have different rates of oxidative activity. Heart muscle is most active, liver tissue much less, and skeletal muscle still less."

The quantitative determination of vitamin A, H. C. SHERMAN and H. E. MUNSELL (*Jour. Amer. Chem. Soc., 47 (1925), No. 6, pp. 1639–1646, fig. 1*).—The method which has been developed in the senior author's laboratory for the quantitative determination of vitamin A in food materials is described in detail.

The basal diet adopted consists of casein extracted with alcohol, as described by Osborne and Mendel (E. S. R., 45, p. 264), 20, starch 70, dried brewery yeast 5, Osborne and Mendel's salt mixture 4, and sodium chloride 1 part. For comparative vitamin A experiments, it is considered preferable to use rats from the same stock reared on the same diet. The diet in the present case was one-third dried whole milk and two-thirds ground whole wheat, with sodium chloride to the extent of 2 per cent of the weight of the wheat. The young are placed on the vitamin A-free ration at the age of 28 or 29 days and are kept on this ration until their weight has been stationary for about a week or has begun to decline. The animals are then placed in separate cages with screen bottoms to prevent access to feces, and the food to be tested is administered separately from the basal ration. One in each group is kept on the basal diet alone. A definite small gain in weight as the result of the addition of the food being tested is considered the best basis for quantitative comparison. An average gain of 3 gm. per week during an experimental period of 8 weeks is the standard adopted as most satisfactory. With this small gain the possible complicating effects of the presence or absence of the antirachitic vitamin are considered to be minimized.

All of the animals are killed at the end of 8 weeks and autopsied for evidence of abnormalities. In the experience of the authors, 85 per cent of the negative controls developed ophthalmia and 76 per cent pus in one or more of the glands near the base of the tongue. Lung trouble noted by Steenbock and Nelson (E. S. R., 50, p. 364) was seldom observed.

Typical experiments carried out according to the method are reported for tomatoes. The animals receiving 0.2 gm. of tomato six times a week showed almost precisely the desired average gain of 3 gm. per week for the 8 weeks of the experimental period.

Quantitative experiments upon the occurrence and distribution of vitamin A in the body, and the influence of the food, H. C. SHERMAN and L. C. BOYNTON (*Jour. Amer. Chem. Soc., 47 (1925), No. 6, pp. 1646–1653, figs. 2*).—A brief summary is given of the data obtained in a study conducted simultaneously with that noted above of the relative amounts of vitamin A in several of the tissues of adult rats of known dietary histories.

In the first series, young rats of the same stock, but from families on different diets, were placed at weaning on the basal diet described in the above paper and their survival periods noted as an indication of the store of vitamin A in the body. On a diet consisting of one-sixth whole milk powder and five-sixths ground whole wheat the survival period was about 40 days, on one-third whole milk powder and two-thirds ground whole wheat almost 60 days, and on two-thirds whole milk powder and one-third ground whole wheat about 75 days. The second of these diets is considered the most satisfactory for use as the basal diet in vitamin A experiments.

In the second series of experiments, the tissues of healthy adult rats which had been kept on various diets were fed to test animals as the sole source of vitamin A, using the method described above. In the first of these experiments, the muscle, liver, lung, and kidney of rats which had been kept on a

diet of one-third whole milk powder and two-thirds ground whole wheat were used as the source of vitamin A. As judged by the average growth curves, the kidney appeared to be at least 40 times, the lung more than 40 times, and the liver from 200 to 400 times as rich in vitamin A as the muscle. Of the total amount of vitamin A in the body of a typical adult rat, about nine-tenths appears to be located in the liver and the remaining tenth about equally divided between the muscles, the blood, the kidneys, and the lungs.

A comparison of the content of vitamin A in the tissues of rats on the above ration and on one-sixth milk and five-sixths ground whole wheat showed an increase in the concentration of vitamin A in the liver of at least 300 per cent and in the muscle of not over 30 per cent on the ration richer in A. No difference in the concentration of A in the kidneys of the rats on the two diets could be detected, and in the lungs there was apparently about twice as much vitamin A on the richer diet.

A final series of experiments was made to verify the conclusion that the differences found in the preceding series were due to the variation in the vitamin A content of the foods. The procednre consisted in comparing the tissues of 10-weeks-old rats that had received additions of cod liver oil to the basal diet with tissues of rats of the same age and diet without cod liver oil. In all the tissues except the muscle, those receiving cod liver oil were richer in vitamin A than those not receiving the oil.

Vitamins A and B in the pecan nut, W. D. Salmon and C. W. Livingston (*Jour. Home Econ.*, *17* (*1925*), *No. 3*, *pp. 129–135*, *figs. 3*).—Pecan kernels were tested for the presence of vitamin A by curative feeding experiments on rats and for vitamin B by prophylactic and curative tests on pigeons and prophylactic tests on rats.

While the minimum amount of the pecan kernel required as the sole source of vitamin A was not determined, an immediate growth response was obtained on the addition of either 20 or 40 per cent of the kernel to the basal vitamin A-free ration. The minimum daily dose of the pecan kernel to protect pigeons weighing from 314 to 384 gm. was from 3 to 3.4 gm., representing from 17 to 20 per cent of the total food. The loss of weight of rats on a vitamin B-free ration was checked by the addition of 10 per cent of pecan to the diet. An appreciable but not normal growth followed the addition of 60 per cent of pecan.

Vitamin B in meat and eggs, R. Hoagland (*Amer. Soc. Anim. Prod. Proc. 1923*, *pp. 25–27*).—A summary of studies previously noted from another source (E. S. R., 52, p. 161).

Vitamin B in tikitiki extract prepared by the Philippine Bureau of Science, F. O. Santos and E. G. Collado (*Philippine Agr.*, *14* (*1925*), *No. 4*, *pp. 243–245*, *pl. 1*).—Tikitiki extract (extract of rice polishings) prepared by the method employed by the Philippine Bureau of Science (E. S. R., 46, p. 569) was found to be effective in 0.5 cc. daily doses in restoring gain in weight in rats which had been losing weight on a vitamin B-deficient diet.

The vitamins and the growth of bacteria [trans. title], V. Izrail'skiĭ and E. Runov (*Nauch. Agron. Zhur.* (*Jour. Landw. Wiss.*), *1* (*1924*), *No. 3*, *pp. 230–235*).—It is reported that an extract of potato juice filtered through a Chamberland filter is capable of stimulating the growth of certain bacteria such as *Bacterium fluorescens*. The stimulating substance or vitamin is destroyed by heating in alkaline solution for 10 minutes at 100° C. and still more easily at 120°. It is not precipitated by alcohol. The activity of the extract is lowered by a second filtration through the Chamberland filter.

On the relation of thyroid secretion to specific dynamic action, E. J. BAUMANN and L. HUNT (*Jour. Biol. Chem.*, *64* (*1925*), *No. 3*, *pp. 709–726*).—To test the theory that the thyroid gland is an essential factor in the phenomenon of specific dynamic action, a comparison was made of the heat production in normal and thyroidectomized rabbits following the ingestion of definite amounts of glucose. The specific dynamic action of 15 gm. of glucose was determined 5 times in 4 normal rabbits and 11 times in 7 rabbits at intervals of from 12 to 86 days after thyroidectomy, and that of 25 gm. of glucose 10 times in 6 normal rabbits and 31 times in 6 rabbits from 8 to 411 days after thyroidectomy.

In the normal animals the total extra heat resulting from the 15 gm. of glucose varied from 1.31 to 3.81 calories, with an average of 2.23 calories. Corresponding figures for the 25 gm. were 4.38, 5.93, and 5.13 calories.

In the thyroidectomized animals there was in general a gradual decrease in the specific dynamic action of the glucose to a level considerably below normal, and in 5 of the 10 animals there was no specific dynamic action even after 25 gm. of glucose. Careful macroscopic and microscopic examinations of the thyroid area indicated that with complete removal of the thyroid the specific dynamic action of the glucose was completely abolished in about 65 days, but that with increasing amounts of the tissue remaining the length of time before the complete disappearance of the action was proportionately increased. Feeding thyroid gland or in some instances potassium iodide restored the specific dynamic action of the glucose.

In discussing the possible mechanism of specific dynamic action, the authors advance and defend the following theory:

"In the disposal of some of the absorbed products of digestion, by storage or oxidation, we believe then that thyroid secretion normally plays a part. In some of these reactions we may reasonably assume that heat is liberated. In the postabsorptive state, these same reactions in which thyroid secretion enters occur in the catabolism of foods from the body stores; the heat evolved can then be used for maintenance of body temperature. But during absorption of a meal or whenever there is what Lusk has aptly called a plethora of intermediary metabolites in a group of cells, this evolved heat may be greater than can be used for the maintenance of body temperature and for taking part in endothermic reactions (if the extra heat can be used in this way). A rise in body temperature must then result or heat be given off. The latter is the usual occurrence and the extra heat is the specific dynamic action. It is, as Lusk has stated, a metabolism of plethora."

A bibliography of 23 titles is appended.

The thyroid during pregnancy: Clinical observations, P. A. DALY and S. STROUSE (*Jour. Amer. Med. Assoc.*, *84* (*1925*), *No. 24*, *pp. 1798–1800*).—Clinical observations are reported indicating that in some cases the increased irritability, nervousness, and emotionalism often occurring during pregnancy may be traced to increased activity of the thyroid with resulting deficiency of iodine, and may be relieved by the administration of iodine.

Enlarged parathyroids in rachitic chickens, L. P. DOYLE (*Science*, *61* (*1925*), *No. 1570*, *p. 118*).—This is a brief note to the effect that in truly rachitic chickens there is always to be found an enlargement of the parathyroid glands similar to that reported by various investigators for rats and children.

The relation of exercise to rickets in white rats, A. W. FROST (*Science*, *61* (*1925*), *No. 1582*, *pp. 447, 448*).—In a comparison of the extent of rickets, as determined by the appearance of the costochondral junctions on autopsy, in rats of the same litter and on the same rickets-producing diet but differing in

the amount of exercise which they had been forced to take on a treadmill device, no difference in the extent of rickets attributable to lack of exercise could be noted.

The antirachitic activation of foods and of cholesterol by ultraviolet irradiation, A. F. Hess (*Jour. Amer. Med. Assoc., 84 (1925), No. 25, pp. 1910–1913*).—This is a general discussion of the nature and importance of the antirachitic activation of the cholesterol of animal foods and the phytosterol of vegetable foods by ultraviolet irradiations (E. S. R., 53, p. 767). It has been found that the characteristic absorption spectrum of cholesterol becomes more transmissible for ultraviolet irradiation after being subjected to the rays of the mercury vapor lamp, and that this test can be used to supplement the biological test. That the change brought about in cholesterol by irradiation is of a comparatively simple chemical nature is considered to be demonstrated by the ease with which skin deprived of all connection with the nervous and circulating systems can be activated. Crystalline cholesterol on prolonged exposure to ultraviolet rays again becomes inert. This fact and the observation that prolonged irradiation tends to decrease the immunity of the blood point to caution in the dosage of ultraviolet irradiation.

Previous observations that various green vegetables, notably spinach and lettuce, are lacking in antirachitic properties, and similar findings with green vegetables grown under the tropical sunlight of the West Indies, are cited to illustrate the difference in effect between solar and artificial irradiation. Data are given on the curative effect in infantile rickets of artificially irradiated carrots, spinach, and dry milk. The least satisfactory results were obtained with carrots. The lack of activation in this case is attributed to the inhibiting effect of carotin.

In spite of the fact that food materials can be so readily activated, the author questions the practical value of such a means of protecting infants against rickets in place of the use of cod liver oil or egg yolk or direct irradiation. He points out, however, that "the established fact that foods, as well as cholesterol and phytosterol, can be endowed with specific antirachitic potency has, quite apart from any clinical application, decided theoretical interest and value. It demonstrates a definite physiologic process by which ultraviolet rays can bring about a change in the tissues, and furnishes a chemical basis for interpreting one of the effects of heliotherapy."

"Russell effect," not ultraviolet light, responsible for changes produced in the photographic plate by antirachitic substances, I. N. Kugelmass and I. McQuarrie (*Science, 62 (1925), No. 1595, pp. 87, 88*).—The authors refute their previous conclusions that substances known to be curative for rickets possess the power to emit ultraviolet light on oxidation (E. S. R., 52, p. 668).

Ultraviolet light and scurvy, J. H. Clark (*Science, 61 (1925), No. 1567, pp. 45–47, figs. 2*).—The possibility that sunlight or ultraviolet radiation might have a beneficial effect on guinea pig scurvy was tested in three series of experiments with different scorbutic diets and exposure to ultraviolet light and in one series to sunlight.

In all cases ultraviolet radiation proved entirely ineffective in preventing or postponing scurvy. On some of the diets which were lacking in other essentials as well as vitamin C it appeared to hasten the loss in weight and death from scurvy and to prevent recovery after the addition of orange and cabbage to the diet.

The viability of typhoid bacilli in shell oysters, E. O. Jordan (*Jour. Amer. Med. Assoc., 84 (1925), No. 19, pp. 1402, 1403*).—In this study a barrel

of live shell oysters was divided into four lots which were completely immersed in sea water in large glass jars, to three of which suspensions of different strains of typhoid bacilli were added. At the end of an hour the oysters were drained separately, placed in sterile halves of Petri dishes, one oyster to a dish, and the dishes placed in an ice box, the temperature of which ranged from 5 to 8° C. (41 to 46.4° F.) Each day for 30 days oysters were removed from each of the jars and the shell liquor and stomach contents tested for *Bacillus typhosus*. No typhoid bacilli were found in the controls, but live organisms were found in the others up to the twenty-first, twenty-second, and twenty-fourth days.

Viability of Bacillus typhosus in oysters during storage, F. O. Tonney and J. L. White (*Jour. Amer. Med. Assoc., 84 (1925), No. 19, pp. 1403–1406*).—This paper reports a somewhat more elaborate investigation than the one noted above of the viability of *B. typhosus* in oysters. Heavily contaminated shucked oysters were stored at 98, 70, and 45° F., and living shell oysters were placed in a 4 per cent solution of commercial sea salt to which typhoid bacilli had been added and were allowed to remain in the water for 48 hours at from 60 to 70°. They were then placed in dry sterile containers, some of which were kept at room temperature, 70°, and others in the ice box at 45°.

Subsequent examination of the fluid of the oysters and of the exterior of the shells showed the presence of live typhoid bacilli in the shucked oysters after 1 day at 98°, 4 days at 70, and 22 days at 45°. In the shell oysters the organisms survived in considerable quantities for 8 days at 70° and 60 days at 45°. The exterior of the shell showed the presence of live organisms after storage in the ice box for 23 days. In general the organisms survived longer than the oysters themselves.

Botulism poisoning, W. G. Sackett (*Colorado Sta. Press Bul. 61 (1925), pp. 4*).—A brief discussion of the essential facts concerning botulism—its cause, means of prevention, symptoms, and treatment.

TEXTILES AND CLOTHING

The constituents of raw cotton, A. J. Hall (*Textile Colorist, 46 (1924), No. 547, pp. 421–425, figs. 3*).—A review of recent literature on the subject.

The wetting of cotton.—I, Wetting of raw cotton by hot starch pastes, F. D. Farrow and S. M. Neale (*Brit. Cotton Indus. Research Assoc., Shirley Inst. Mem., 4 (1925), No. 4, pp. 35–48, figs. 9; also in Jour. Textile Inst., 16 (1925), No. 7, pp. T209–T222, figs. 9*).—This paper describes measurements made to find the extent that surface forces influence the wetting of yarn during sizing.

The surface tensions measured indicated that most ordinary sizing preparations wet raw cotton imperfectly and reversibly, and relatively large quantities of substances lowering the surface tension are required as additions to size to produce spontaneous wetting. However, effective wetting of cotton does not depend entirely on the ability of a liquid to spread over it spontaneously but can also be caused by forcing the liquid into the pores of the material. This is effected in practice both by squeezing the yarn between rollers in the presence of size and by using boiling size. A high temperature facilitated escape of air from the yarn.

The moisture relations of cotton.—IV, The absorption of water by cotton mercerised without tension, A. R. Urquhart and A. M. Williams (*Jour. Textile Inst., 16 (1925), No. 6, pp. T155–T166, figs. 4; also in Brit. Cotton Indus. Research Assoc., Shirley Inst. Mem., 4 (1925), No. 2, pp. 5–16, figs. 4*).—

The relation between the degree of mercerization of a cotton and its moisture regain was examined in further studies (E. S. R., 52, p. 532). The variations in water-fixing power of mercerized cotton with the concentration of the mercerizing solution used strikingly resemble the variations in dimensions of the unit fibers. The ratio between the moisture content of the mercerized and unmercerized, scoured cottons at the same atmospheric humidity is independent of the degree of that humidity. Mercerization appears to increase the accessible surface of cotton in proportion to the mercerization ratio, which might be used as an index of the increased absorptive capacity of the material for water and for dyes.

The swelling of raw cotton hairs during mercerisation without tension, M. A. CALVERT and F. SUMMERS (*Brit. Cotton Indus. Research Assoc., Shirley Inst. Mem., 4 (1925), No. 5, pp. 49–84, pls. 2, figs. 12*).—Width changes occurring in cotton fiber during mercerization without tension are described. The relation of the mercerized to the unmercerized fiber width was examined in 38 world cottons, and causes were suggested for variations in the ratio. The regularity of width change in the mercerizing liquid during washing and after complete mercerization was demonstrated in 11 typical cottons. Study of Punjab-American cotton in solutions of sodium hydroxide ranging from 5 to 80° Twad. (2.5 to 36.7 per cent) indicated that additional width change can not be obtained in concentrations beyond 35° (15.8 per cent).

Investigation of transverse sections of collapsed fibers during mercerization and of uncollapsed fibers from the boll, before and after treatment with sodium hydroxide, showed that maximum width change occurs when the swollen fiber attains its original width in the boll before collapse. This maximum appears due to the presence of the cuticle of the fiber which limits the amount of outward swelling. The fact that the cuticle can contract longitudinally and follow the shrinkage of length of the fiber in sodium hydroxide while it follows the outward swelling in width is discussed, and a connection is suggested between the microscopic structure of the cuticle and the function of the cuticle during mercerization. The biological foundations of the mercerization process are dealt with briefly.

Studies on the swelling of cotton cellulose: Cotton hairs in solutions of lithium, rubidium, and caesium hydroxides, G. E. COLLINS (*Jour. Textile Inst., 16 (1925), No. 5, pp. T123–T126, pl. 1, fig. 1*).—The present paper completes a study of the dimensional changes suffered by single cotton fibers when immersed in solutions of the five alkali metal hydroxides (E. S. R., 53, p. 312), the three rare members of the series being included in order to illuminate the theory of the swelling process. The fact that sodium hydroxide is by far the most effective member of the group as a mercerizing agent is confirmed, and it is also shown that with either lithium, sodium, potassium, or rubidium hydroxide, maximum swelling is brought about by that solution in which the metallic ion is fully hydrated.

A sorting machine for flax fibre-strands and similar material, J. A. MATTHEW and G. F. NEW (*Jour. Textile Inst., 16 (1925), No. 6, pp. T197–T208, pls. 2, figs. 4*).—With the new sorting machine described, flax and similar fiber strands up to 30 in. long can be handled, and a test including calculations completed in about 2 hours.

In the sorting operation fiber strands are placed perpendicular to a common base line in a row of gills. When enough material has been arranged the gills are advanced by screws by regular steps, and the strands projecting at the side opposite the base line after each advance are removed in groups differing in length by similar steps. These groups are weighted and a weight-length com-

position diagram constructed from the results. The mean area of cross section of a strand can be determined by counting the strands in each length group as drawn, if the density of the material is known. Either the weight-mean length or the weight-median length is held to provide a satisfactory criterion of the length of a sample. Methods for summarizing data obtained from sorting strands are outlined.

HOME MANAGEMENT AND EQUIPMENT

The economic problems of the home, Mrs. C. G. Woodhouse (*Jour. Home Econ., 17 (1925), No. 9, pp. 498–504*).—The question is raised as to the economic cost of maintaining separate household units, and it is suggested that investigations of this and related problems should include studies on prices and their relation to working conditions, the costs of different systems of marketing, the tariff as it influences both the income and the outlays of the home, and taxation systems as they affect prices. Other unsolved problems are associated with rent, the contribution of the housewife to the national income, and part-time work.

Disbursement of family income, A. E. Taylor (*Jour. Home Econ., 17 (1925), No. 9, pp. 487–494*).—The author directs attention to the diversification and expansion of the standard of living and declares that specific study of the elasticity of demand for the principal items in the family budget is needed. With regard to the item of food, investigations are needed which would deal with their nutritional, service, and price relations. Suggestions are offered as to investigatious of consumers' choices and the influence of advertising on consumers' valuations and behavior.

Influence of electric cooking on the load condition of power systems [trans. title], C. Hässler (*Elektrotech. Ztschr., 44 (1923), No. 23, pp. 542, 543, figs. 4*).—The effect of electric cooking on the load conditions in the various parts of an electrical supply system, including the power station, feeders, and consumers' circuits, is analyzed, and load curves and numerical data are given from a network in the neighborhood of Stockholm, Sweden, which operates at 220 volts direct current with underground feeders and overhead distributors. A restricted hour tariff is employed, and the supplies for cooking and lighting are metered separately.

The annual consumption for lighting averaged 190 kw. hours per consumer and for cooking 1,750 kw. hours per household. About 20 per cent of the total consumption for cooking fell within the period of the lighting peak.

The cooking load fell off rapidly after 5 p. m. and did not seriously increase the evening peak. With the double tariff in force electric cooking was responsible for 0.44 kw. maximum demand per connected consumer using current for cooking, this demand occurring between 8 and 10 p. m. during the winter months. The double tariff transferred the combined cooking and lighting peak to the morning hours when about one-third of the lighting consumers used electric cooking. The addition of the cooking load was felt most in the distribution mains.

It is considered good policy to supply cooking loads at cost. A thermal storage oven for a family of four or five persons consumes from 350 to 500 watts continuously and has an effect on the load curve quite different from that of an ordinary direct heating oven. The thermal storage oven should preferably be switched out of circuit automatically during the lighting peak.

Heat transference and combustion tests in small domestic boiler, H. W. Brooks, M. L. Orr, W. M. Myler, jr., and C. A. Herbert (*Jour. Amer. Soc. Heating and Ventilating Engin., 31 (1925), No. 2, pp. 89–118, figs. 17*).—The

results of a series of tests by the U. S. Bureau of Mines made with various fuels to determine heat absorption and other characteristics of sectional boiler construction are reported. The primary purposes of these tests were (1) to determine the additional amount of heat absorbed by the addition of three sections over the base and fire pot, (2) to obtain data regarding the passage of free oxygen from the ash pit to the space above the fuel bed, and (3) to ascertain the value of ordinary methods of admitting secondary air over the fuel bed when using hard and soft coal and coke. A large amount of data is presented and discussed, and this seems to indicate in general the increased efficiency resulting from the addition of three sections and the importance of admitting secondary air over the fuel bed when burning bituminous coal.

Some hints on installing and operating domestic oil burners, C. H. CHALMERS (*Jour. Amer. Soc. Heating and Ventilating Engin., 31 (1925), No. 10, pp. 471–476, fig. 1*).—Practical information on the subject is presented.

Simple plumbing repairs in the home, G. M. WARREN (*U. S. Dept. Agr., Farmers' Bul. 1460 (1925), pp. II+14, figs. 14*).—This publication describes simple ways of doing little things with the aid of a few simple tools to keep home plumbing in good working order.

MISCELLANEOUS

Agriculture Yearbook, 1924, H. C. WALLACE ET AL. (*U. S. Dept. Agr. Yearbook 1924, pp. V+1252, pl. 1, figs. 306*).—This contains the report of the Secretary of Agriculture, five special articles abstracted elsewhere in this issue, and the usual statistics, noted on page 84.

Thirty-second Annual Report of [Minnesota Station, 1924, III] (*Minnesota Sta. Rpt. 1924, pt. 3, pp. 35, figs. 21*).—Popular discussions are presented of some of the experimental work in agronomy, soils, horticulture, and forestry. The experimental work reported is for the most part abstracted elsewhere in this issue.

Thirty-seventh Annual Report of [Rhode Island Station, 1924], B. L. HARTWELL (*Rhode Island Sta. Rpt. 1924, pp. 14*).—This report includes experimental work for the most part abstracted elsewhere in this issue.

These fifty years, R. P. CRAWFORD (*Nebraska Sta. Circ. 26 (1925), pp. IX+175, pls. 9*).—This is a history of the College of Agriculture of the University of Nebraska.

List of available publications, July 1, 1925 (*Nebraska Sta. Circ. 27 (1925), pp. 7*).—Available publications of the station and the extension service are listed.

Aids to writers and editors, compiled by E. L. DAY (*U. S. Dept. Agr., Bur. Agr. Econ., Agr. Econ. Bibliog. 6 (1925), pp. [2]+8*).—This mimeographed bibliography comprises a selected list of books on the preparation of manuscripts and the mechanics of writing.

NOTES

Alaska Stations.—As a measure of economy, the Rampart Station in the Yukon Valley has been closed since September, 1925. A change has been made at the Kodiak Station, also in the interest of economy, by reducing the herd of cattle to the few head of purebred Galloways. The remaining animals have been transferred to the Matanuska Station, where there are now maintained under identical conditions Milking Shorthorns, Holstein-Friesians, and crossbred Galloway-Holsteins. Comparative tests will be made of the amount of milk produced by each of these three classes of cows for the feeds consumed, as well as their comparative hardiness.

Hans Lindberg, horticulturist at the Sitka Station, has resigned. J. C. Wingfield, assistant horticulturist at Matanuska, has been given authority to assist in a ten-week course for farmers during January, February, and March, at the Alaska college.

Maryland University.—The College of Agriculture in cooperation with the Institute of American Meat Packers has inaugurated a course of lectures for meat packers in Baltimore, with an enrollment of about forty students and with C. V. Whalin of the Bureau of Agricultural Economics, U. S. D. A., as special lecturer in charge.

Mississippi Station.—Miss Dorothy Dickens, of the Mississippi State College for Women, has been appointed head of the home economics research department. J. M. Langston has been appointed assistant entomologist during the year's leave of absence of H. W. Allen.

Rutgers University and New Jersey Stations.—A conference of New Jersey bankers was held at the College of Agriculture December 1, 1925, to consider means of closer cooperation between farmers and bankers. Three new industrial fellowships have been established for graduate study in the College of Agriculture by the National Fertilizer Association, the American Trona Corporation, and the Chemical Foundation, respectively.

Forrest H. Clickner, instructor and assistant in poultry husbandry, has resigned. Howard F. Huber has been transferred from instructor in vegetable production to assistant director of the station, succeeding Frederick A. Hall, resigned.

Utah College and Station.—In response to the increased interest in dairy husbandry, several special courses in dairying have been added, as well as a complete dairying short course from January 18 to February 6, with intensive instruction in butter and cheese making, the handling of market milk, and ice cream manufacture.

Mrs. Almeda Perry Brown, for three years district home demonstration agent with the extension service, has been appointed a special investigator on the station staff to study rural standards of living in relation to food habits and requirements.

Vermont Station.—A. H. Robertson, assistant in research bacteriology at the New York State Station, has been appointed research dairy bacteriologist, entering upon his new duties February 1.

Association of Official Agricultural Chemists.—The forty-first annual meeting of the association was held at Washington, D. C., October 26–28, 1925, with an attendance of about 250. The usual program was followed, reports from the various referees occupying the first and the greater part of the second day, and committee reports the third and final session.

The presidential address by C. A. Browne on The Purposes and Aims of Agricultural Chemical Analysis dealt in a clear and forceful manner with the relationship between agricultural chemical analysis and agricultural chemical research. Basing his discussion upon the recent revision of Official and Tentative Methods of Analysis and the reviews concerning it which have since appeared, Dr. Browne traced the history of the development of methods of agricultural chemical analysis from the first pamphlet issued by the association 40 years ago to the present edition of the Official Methods, and showed the gradual tendency to depart from the exclusively regulatory lines of activity originally laid down as the purpose of the association and to develop methods of analysis as applied to agricultural research. In his opinion there is need for still greater development along the latter line. Among the subjects in which improved methods and greater emphasis in the work of the association are considered to be needed are certain methods in soil analysis, including mechanical analyses and methods of determining H-ion concentration; improved methods for determining minute quantities of elementary constituents of foods, such as fluorine, iodine, iron, and chlorine; the study and selection of suitable analytical methods of ascertaining the rarer organic constituents of plant and animal substances; and methods for the detection and determination of vitamins. Other ways in which the association can be of service were briefly outlined, including greater cooperation between research and regulatory chemists and a consideration of the industrial point of view in the choice of methods of analysis. In this connection the unfairness was pointed out of eliminating one of two neutralizing errors in a determination without at the same time eliminating the compensating error.

Dr. Browne's address was followed by the usual informal talk of the honorary president, H. W. Wiley, who outlined some of the achievements of the association from its earliest days, particularly in fostering intensive agriculture.

R. W. Dunlap, Assistant Secretary of Agriculture, extended the greetings of the department to the association and congratulated it on its achievements in the application of the basic principles of chemistry to the solution of pressing agricultural problems. In his opinion a problem requiring attention in the immediate future is the development of more diversified utilization of crops.

Announcement was made by J. G. Lipman of the first International Congress of Soil Science which is to meet at Washington, D. C., in June, 1927, for about 10 days, following which there is to be a transcontinental tour of about a month for the purpose of observing soil types in various sections of the country. Another announcement of interest was made by the secretary of the association, W. W. Skinner, in a letter from Doctor Wiley offering to the association under certain conditions involving subsequent revisions the copyrights of his books on the Principles and Practice of Agricultural Analysis. The offer was accepted by the association.

Of the committee reports, that of the committee on definition of terms and interpretation of results on fertilizers was received with especial interest, as it involved the first final adoption of a number of definitions and terms, including basic phosphate slag, interpretation of the word "lime" as applied to fertilizers, dried pulverized or shredded manures, manure salts, and sulfate of potash-magnesia. These will appear in final form in the proceedings of the

association. In his report of the committee on bibliography, W. W. Skinner stated that reviews are being prepared by B. B. Ross on potash, R. N. Brackett on phosphoric acid, and H. B. McDonnell on nitrogen in fertilizers, and by F. B. Fuller on cattle feeds, W. H. MacIntire on soils, and C. C. McDonnell on insecticides. These reviews are to be brought up to the date of the present edition of the Official Methods.

Resolutions were adopted on the death of five members of the association during the past year, G. L. Spencer, A. L. Burns, E. F. Ladd, C. L. Penny, and E. G. Proulx.

The officers of the association elected for the coming year were as president W. W. Randall; vice president, W. H. MacIntire; secretary-treasurer, W. W. Skinner; and additional members of the executive committee, O. Schreiner and E. M. Bailey.

American Society of Agronomy.—The eighteenth annual meeting of this society was held at Chicago, November 16 and 17, 1925. The attendance was in excess of 200.

Following the custom of recent years, the program was arranged to consist largely of symposia. The first day was given up mainly to morning and afternoon sessions on the subjects of Methods and Relations in Extension Work in Agronomy, and Soil Deterioration, under the leadership, respectively, of O. S. Fisher and Director S. B. Haskell. The second day was organized into sections of farm crops and soils. In farm crops symposia were prepared on The Present Status of Corn Improvement, led by F. D. Richey, and Controlling the Quality of Crops, in charge of Dr. H. L. Walster. In soils the subjects were Base Exchange Phenomena in Soils, and Soil Bacteriology—Nitrification Studies, and the leaders Drs. R. Bradfield and A. L. Whiting, respectively. The number of papers presented was very large, and despite attempts at limitation of their length the sessions were quite protracted.

The presidential address was given by Director C. W. Warburton, his subject being Taking Agronomic Research to the Farmer. In this address the organization of the extension work and some of the concrete achievements as related to agronomy were described.

The report of the editor of the *Journal of the American Society of Agronomy* showed a very prosperous condition. A total of 140 papers were received during the year, these being contributions from 35 of the agricultural colleges and experiment stations in addition to the Federal Departments of Agriculture and Commerce, Canadian and foreign institutions, and commercial companies. The secretary's report showed a membership of 646, all States, the District of Columbia, and Alaska being represented, with 21 members in Canada and 57 in other foreign countries.

Secretary W. M. Jardine was elected an honorary member of the society and the following were chosen fellows: Charles E. Thorne, C. R. Ball, S. B. Haskell, R. W. Thatcher, M. F. Miller, J. G. Lipman, T. L. Lyon, C. V. Piper, C. W. Warburton, P. E. Brown, L. E. Call, and C. A. Zavitz.

The election of officers resulted in the choice of Director C. G. Williams as president and Dr. A. G. McCall as fourth vice president. As representatives of the society to other organizations, Dr. R. W. Thatcher (one year) and F. E. Bear (two years) were selected for the Council of the Union of Biological Societies, Dr. B. L. Hartwell and M. F. Miller for the Council of the American Association for the Advancement of Science, and Dr. T. A. Kiesselbach (five years) for the Committee on Cooperation with the National Research Council.

American Society of Animal Production.—The annual meeting of the American Society of Animal Production, held on November 27 and 28, 1925, in Chicago, was undoubtedly one of the most successful meetings of that society, both from the standpoint of the quality of the papers presented and the attendance. Representatives of over 20 experiment stations, as well as the U. S. Department of Agriculture and commercial organizations, presented papers. The fullness of the program tended to prevent discussion to some extent, but keen interest was shown in all the papers given.

The program included two reports on net energy values, by E. B. Forbes and E. B. Meigs, which tended to create considerable discussion on the first morning. Other papers presented at that time included the results of fattening experiments with cattle and sheep and discussions of feeding problems, as well as two papers on breeding.

The society was divided for two luncheon sessions. At one the policies for feeding experiments were discussed by E. J. Iddings, E. S. Good, John M. Evvard, E. A. Trowbridge, H. P. Rusk, C. W. McCampbell, and H. J. Gramlich, with C. N. Arnett presiding. The other session was devoted to breeding problems, with special reference to crossbreeding. A paper dealing with a modification of Manoiloff's test for sex was given by D. G. Steele and A. Zeimet.

One of the most interesting papers of the meeting was given by E. B. Hart on the factor of light in mineral nutrition, and on Saturday morning the problems of mineral nutrition were further presented by L. A. Maynard and F. B. Morrison, and a discussion led by H. H. Mitchell followed. An evening was largely devoted to the subject of meat. An account was given by J. H. Shepperd of a livestock tour around the world, dealing especially with the type of bacon desired on the London market and in the British Isles. Favorable results of feeding meat to rats in 12 years' experiments were outlined by J. R. Slonaker, and C. E. Chatfield presented a paper on correlations of various constituents of beef of different qualities. The cooperative meat investigations being conducted with the various experiment stations and the U. S. Department of Agriculture were outlined by E. W. Sheets and R. C. Pollock, while O. G. Hankins, G. S. Templeton, and C. M. Vestal spoke on the soft pork investigations which have been conducted in a similar way for several years. At a later session further papers dealing with the quality and palatability of meat were presented, as were also various extension problems.

The meeting was concluded by a dinner in honor of Dean C. F. Curtiss of Iowa, at which the achievements of Dean Curtiss as a dean and director and a livestock breeder, as well as his relations to the student body and his associates, were commended by former Secretary of Agriculture H. M. Gore, F. O. Lowden, W. H. Pew, C. L. Burlingham, John Clay, and A. H. Sanders. The Oklahoma College stock-judging team, which won the intercollegiate contest at the 1925 International Livestock Exposition, was presented at this time, and the prizes for the Saddle and Sirloin essay contest written on the subject of the ton litter were awarded. H. B. Raffensperger spoke on the life and work of the late B. H. Ransom.

The officers elected for the ensuing year are as follows: H. P. Rusk, president; E. S. Good, vice president; and E. W. Sheets, secretary-treasurer. Paul Gerlaugh was chosen chairman for the extension section.

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EXPERIMENT STATION RECORD

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The year which has elapsed since the passage of the Purnell Act has been a period of marked progress in the organization of various lines of agricultural research, but in few has interest been more keen than in agricultural economics and rural sociology. This interest has been evidenced in part by the formulation of upwards of two hundred new station projects in these fields, thus enlarging the volume of experimentation as never before. Perhaps an even more encouraging development than this, however, is the earnest study which has been and is being given to the improvement of the quality of this research, and the growing appreciation of the need of organizing its prosecution on the basis of specific objectives and the most effective methods.

Much concern as to these matters has recently been manifested in a number of directions and by various groups of workers. One of the most stimulating and suggestive papers at the Chicago convention of the Association of Land-Grant Colleges was a discussion of the principles which should characterize sound investigation in the fields of agricultural economics and rural sociology, presented by Dr. J. D. Black of the University of Minnesota before the experiment station division. Subsequently the American Farm Economic Association held its three-day annual meeting with its general topic the question of research in agricultural economics, and the rural sociology section of the American Sociological Society, meeting during the same week, devoted its entire attention to the subject of research in rural social problems. These various meetings afforded opportunity for a thorough discussion of the broad questions involved and should prove of great assistance in clarifying the research situation in these fields of inquiry.

Although the problems of objectives in research and methods of attaining them are by no means confined to agricultural economics and rural sociology, the relatively recent development of these subjects lends special timeliness and pertinency to a consideration of such matters from their distinctive points of view. As was stated in the presidential address of Mr. M. L. Wilson before the American Farm Economic Association, the challenge of the present to the economic and social sciences is that with regard to agriculture they

must meet its demands as ably as the biological and physical sciences have aided the solution of problems and contributed to progress in the technical production aspects of farming.

Comparison of the economic and social sciences with the biological is quite natural at the present time in view of the relative status of their research aspects. The former are less advanced than the latter, both in the ground covered and the technic developed, and the process of evolution in the biological sciences is being repeated. For a time broader problems are likely to be dealt with, having less definite and concrete objectives. The work partakes of the broadly descriptive, enumerative, and explorative stages, but it leads by analogy to the conclusion that the tendency in economic and sociological investigations will be and should be for them also to become more and more clearly defined and focused upon specific objectives. Despite certain differences in viewpoint and emphasis, the fundamental purpose of advancing from the known into the unknown is held in common.

In the opening paper before the American Farm Economic Association, the need for specific objectives in economic research was discussed at length by Dr. E. W. Allen of this Office, who took for his thesis the view that a constructive purpose is essential to any real research. "It is," as he expressed it, "the central idea underlying the method of science, determining all else—the means of approach, the data to be secured, the course of procedure. The more specifically the object can be defined the more direct the investigation is likely to be and the more evident the end when it is reached."

Unfortunately, this view is not always accepted. Sometimes there is a lack of understanding of the problem, which is seen in its large manifestations instead of a complex combination of features, and the attempt is made to attack it as a whole, with the usual result of undertaking too much. In other cases, there may be a belief that any gathering of facts or scientific material is the pursuit of science, and a consequent disinclination to accept the orderly method of procedure.

Indefiniteness or obscurity of purpose was cited as one of the inherent weaknesses of experimental work in the past which unless carefully guarded is likely to be a handicap to investigation in the newer fields. "There are carloads of data supplied by experimental tests and field trials which have been of but little more than incidental use because the effort was not guided by a clear purpose, there was no constant study to determine where it was leading, and in the end no proper basis for drawing conclusions. These accumulations represent a by-product, the main value of which lies in the experience it has furnished." That this condition should have

existed was inevitable in the rapid expansion of agricultural investigation and the course of development of methods for it. It shows the way along which we have come, and mistakes are no reflection provided they are profited by and mark advancement. But it may be emphasized that the experience ought to be availed of in future research in economics and sociology as well as biology.

On the basis of objectives, Dr. Black enumerated in the paper already referred to three types of research projects as needed in economics and sociology. The first of these types includes those designed to analyze and explain a particular situation and develop a program of relief for it. The others are intended to elucidate economic and sociological principles and a better methodology.

Dr. Black has estimated that, for the present at least, probably three-fourths of the economic and sociological research energy of the land-grant colleges must be devoted constantly to the first, or relief, type of projects. The attack on such projects ordinarily involves the collecting of data by way of establishing a cross section of the situation, a statistical analysis of this cross section, and the ultimate arrival at conclusions from which specific remedies may be suggested. Often, however, the data will be found of service in their applications in wider areas or they may assist greatly in developing and demonstrating general principles.

Studies of this type are of much benefit, and so long as there is pressure for immediate results they have great justification. Frequently, too, it is possible in a study of particular situations to select those whose analysis will yield results of general and lasting value, and to work on them in such a way as to get results of this kind. But, in any case, they will by no means fully meet the need of formulating principles and reducing them to more definite terms and to a working basis. As Dr. Black has stated, "we are verily only on the threshold of research work with the principles of economics," and "if this is true for economics, it is ten times true for sociology."

In practice the desire to generalize sometimes leads to the selection of too large objectives, a tendency not confined to the fields of economics and sociology. To quote again from Dr. Allen's address, "some workers appear to see problems in the large, the manifestations of a complex situation, and aspire to solve the whole question at once. . . . In such cases the subject is being explored rather than investigated. . . . The large objectives involve seeing and attaining many smaller ones. If expectations are to be realized in the big things, the small things need to be done in a thorough and coordinated way. An objective may be a farseeing one and still be specific; it may furnish a general guide without being so

complex and many-sided that the most one can do is to work around the edges without getting at the real heart of the problem."

In defining the concrete, workable objective, it is important to get at the actual content of the problem, to determine what comprises it and what will be involved in its solution. Many if not most of the problems presented in practice are so complex and many sided as to call for analysis before they can be studied effectively. Constructive investigation upon them depends on advancing step by step, clearing up one point or phase after another, rather than attacking them in their entirety in a broadside effort. The feasibility of an undertaking is no less important than the desirability of it, which makes the practicability of an objective a matter of first consideration. To assemble information over a broad field may not contribute substantially to the main problem or prove adequate to the needs of a concrete objective. The aim of investigation is not to accumulate data but to form a critical judgment about them, and if possible to make a contribution in the form of a reasoned conclusion.

Early focusing upon an objective is often beneficial for another reason. It may help in discriminating between real research—the acquisition and testing of basic facts—and the doing of various things that would be helpful to agriculture and the farmers but which do not constitute investigation. There are a great variety of services which could be rendered to agriculture with advantage, such as current statistics, records of land values, prices and price indexes, estimates of demand and supply, business conditions, and general outlook; but these of themselves do not lie in the field of research unless they are studied in their relationships and used as a means of measuring conditions and trends. In the desire to be helpful, proposals have been sometimes made whose objectives were not research, although involving technical work, but in reality the setting up of current statistical information and general outlook services. It would be desirable to have such current information and advice, as well as various kinds of expert services, but the main purpose of the experiment station ought to be kept clearly in mind and its research funds zealously conserved to that purpose

The question of research methods as applied to agricultural economics and rural sociology is somewhat complex, and it is probable that opinions regarding it vary more widely than as to objectives. The completely controlled type of inquiry so usual in the physical sciences is obviously seldom obtainable in the social sciences, and the experimental method consequently gives place to the statistical method. Dr. Black has rendered a service in this connection by presenting an analysis from which he concludes that

the statistical method, if properly safeguarded, may be both accurate and effective. At the same time he has outlined various difficulties to be contended with and some of the essential precautions to be observed.

The method of deductive analysis, though very little used in the exact sciences, has been warmly commended for many economic and sociological studies. Dr. Black believes that at this time it is *the only method available for attacking certain problems*, and that more careful deductive analysis as a preliminary to many statistical studies would add greatly to their value. "If one begins with the statistics first, he is likely to assemble the wrong data, choose surface rather than fundamental factors as variables, and in consequence have to repeat much of the work, and in some cases never get down to the fundamentals." He cautions, however, that it is very easy to overwork the statistical method, and that its use is sometimes attempted, as in sociology, in problems most of whose elements can not be measured statistically. In such cases he suggests that simple induction from observed phenomena and from historical cases, as well as deductive analysis, is capable of yielding valuable findings.

Similar suggestions were offered by a number of the sociologists. For example, Dr. B. L. Melvin argued that the method of research should become more objective, consisting more largely in the collection of social facts and putting less dependence upon the subjective sciences and their methods.

One question of immediate interest is the place of the survey in these forms of research. It seems to be conceded that much valuable information has been unearthed by this method of procedure, particularly as regards farm management, and its worth under appropriate conditions is quite generally recognized. Its advantages from the standpoint of low costs of obtaining data as compared with intensive cost-of-production studies have been indicated by numerous workers. On the other hand, it is important to appreciate its limitations. Some of these were brought out by Dr. C. L. Holmes, of Iowa, as its static rather than dynamic point of view, the limited applicability of its findings because of insufficient elasticity, and the reliance upon a rule-of-thumb guidance too stereotyped to be of great service in the solution of the problem of the individual farm. As alternatives to the survey method he presented an enlightening discussion of the advantages and shortcomings of cost-of-production studies, the so-called "input-output" method, and what he terms the "problem" method, which is somewhat of a combination of the two and includes the analysis of types of farming on the regional scale.

Doctor Allen has said that for research purposes the survey "represents a temporary stage—a preliminary step; and it is to be dis-

tinguished from field study. Of itself it is largely routine, and it may not get far beyond that stage unless there is a more far-reaching purpose. Frequently it seems to mark a disposition to deal with many things in general and little in particular, to cover too much ground, sometimes in a hurried reconnaissance which skims the surface, while any deeper purposes are hinted at vaguely, if at all, and lie in the dim future. In the meantime, one survey or reconnaissance is followed by another of similar character in another area. Perhaps such a course may be warranted as a temporary expedient, but there is some tendency to regard the ends as sufficient in themselves, with a danger that such activity may come to represent standards in research."

Another interesting contribution to the discussion of methods has been the report of the rural sociological research committee at the New York meetings. On the basis of questionnaires to experiment station directors and about 50 leading rural sociologists, Dr. C. C. Taylor, of the North Carolina College, reported for the committee that the chief difficulties and obstacles which confront rural social research at this time are the formulation of projects which are too broad and sometimes too intangible, the existing shortage in the supply of rural sociologists, especially those with experience and training in research, and the lack of definite and trustworthy technique or methods in the field of investigation.

The committee believes that the two chief tasks ahead are the developing of research methods and trained workers and the familiarizing of station directors with the possibilities and importance of the field. "It is fairly safe to assume that the research done under the auspices of the State experiment stations will have to be fairly well standardized, somewhat restricted in scope by the necessity of their findings being of immediate and clearly revealed practicability, and will have to make use of simple and quantitative techniques. These conditions will be in the main salutary in that they will develop a large body of trustworthy facts on the social problems most clearly recognized by rural people themselves, and will express themselves in terms calculated to give rural social research its much needed scientific standing. Once this task is well done, both the funds and the sympathetic encouragement will probably be forthcoming for a greater latitude and greater magnitude of accomplishment in the field of social research."

The committee strongly recommends the development and extension of the farm population and rural life studies of the U. S Department of Agriculture, as the chief coordinating agency of rural social research, while it believes that to endowed agencies will probably fall "the more delightful task of pioneering new and unexplored fields of research."

The question of coordination of research was also considered by the American Farm Economic Association, which adopted a resolution recommending to the committee on coordination of research of the Association of Land-Grant Colleges that "steps be taken whereby the relationship of the various research workers in the State experiment stations to each national and regional project will be clearly defined, and that steps then be taken whereby continuous coordination of the work of the research workers on each such project can be maintained." Such coordination, it was believed, calls for some central clearing agency for each project with some one assigned sufficient time to keep in touch with the various phases of it. It was further recommended that arrangements be made for an initial conference on the part of the workers on each major project and for such subsequent conferences as may be found necessary or expedient as work on the projects progresses.

If the Chicago and New York meetings did not lead to finality of opinion as to the best way to carry on research under all conditions, they none the less provided opportunity for a timely and constructive interchange of views. The attention concentrated upon research matters at the New York meetings, a more detailed account of which is presented elsewhere in this issue, was especially significant and gratifying as an indication of the reaction of the economics and sociology workers themselves to the enlarged outlook in these fields, as well as a distinct recognition of the importance, in the advancement of agriculture by economic and social agencies, of research as a foundation of a comprehensive program. All this is well, for much is naturally being expected from the application of public funds to a larger extent than ever before to inquiries of this type, and it is important that the most effective objectives and methods of procedure should be worked out as speedily as possible. The active interest which is being manifested in such matters is very encouraging and should be productive of much benefit.

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

Proteins and the theory of colloidal behavior, J. Loeb (*New York and London: McGraw-Hill Book Co., 1924, 2 ed., pp. XIV+380, pls. 2, figs. 113*).—The second edition of this volume, which was completed shortly before the author's death, is based upon the French and German editions, in which numerous experiments corroborative of theories advanced in the first edition (E. S. R., 49, p. 109) were incorporated.

The effects of ions in colloidal systems, L. Michaelis (*Baltimore: Williams & Wilkins Co., 1925, pp. 108, figs. 7*).—The subject matter of this monograph has been assembled and arranged from lectures given by the author at several universities in the United States during April and May, 1924.

A physico-chemical study of cracker dough fermentation, A. H. Johnson and C. H. Bailey (*Cereal Chem., 1 (1924), No. 7, pp. 327–410, figs. 16*).—This is a detailed report from the Minnesota Experiment Station of an extensive investigation of the problems involved in the cracker sponge and dough fermentation process. Crackers from factories throughout the United States were collected, and determinations made of the H-ion concentration, residual carbonates, and the development of rancidity on storage. Representative flours from the same factories were used for the determination of ash, crude protein, viscosity of acidulated suspensions in water, and diastatic action. H-ion concentration determinations were made on the cracker sponge and dough during the fermentation and on the finished crackers. Other determinations included titratable acidity of the sponge, protein determinations during fermentation, physical and chemical properties of the proteins, and the physical properties of the dough as determined in the Chopin extensimeter.

The crackers examined varied in H-ion concentration from pH 5.71 to 8.81, with an average of 7.84. Storage of the crackers resulted in an increase in acidity amounting to a decrease in pH of about 0.3 during 7 weeks. This did not appear to be correlated with the development of rancidity. The most extremely alkaline crackers (pH 10) developed rancidity most rapidly.

The flours used were in most cases milled from soft wheats of an average ash content of 0.49 per cent and a protein content of 9.28 per cent. The quality of the proteins was on the whole better than that generally found in bread flours of higher protein content.

During fermentation the acidity increased from pH 5.85 to approximately 4 ± 0.2. This increase was slow for the first 6 or 8 hours and then rapid until the end point was reached. The addition of sodium bicarbonate to the acid sponge neutralized the acids produced by the fermentation. For the best results it is considered that the cracker dough should have a sufficient excess of sodium bicarbonate to bring the H-ion concentration of an unaspirated suspension prepared from the dough to a pH of 7 to 7.1. A proper excess of bicarbonate aids in the caramelization of the sugars on baking and the browning of the crackers. To calculate the quantity of sodium bicarbonate required to neutralize the acids of fermentation, titration of a cracker sponge suspension to pH 8.4 with a standard sodium hydroxide solution is recommended.

During the first 6 hours of the fermentation period the hydration of the constituents of the dough was found to proceed progressively. At the end of this period the tenacity, viscosity, and elasticity of the gluten tended to break down, partly as the result of proteolytic cleavage of the proteins. The production of alcohol during fermentation was found to have no appreciable effect upon the viscosity or elasticity of the proteins. During the first 6 hours of fermentation the reducing sugar content of the sponge increased, and after this time decreased. Evolution of carbon dioxide was not appreciable until after the first 6 hours. It was calculated that during the fermentation process about 41 lbs. of dry material per 5-bbl. dough, an amount equivalent to about 4 per cent of the flour used, are converted into carbon dioxide and alcohol.

An extensive list of literature references is appended.

The production of experimental test biscuits and their volume measurement, J. R. CHITTICK and F. L. DUNLAP (*Cereal Chem., 2 (1925), No. 2, pp. 87–94*).—Directions are given for making experimental biscuits for the purpose of testing the quality of flour, baking powder, etc., and for measuring their volume.

For the volume measurement, the rape seed method is used, with certain modifications, the chief change being that the biscuits are baked in individual rings in which the volume measurements are made.

A study of the proteases of bread yeast, A. G. OLSEN and C. H. BAILEY (*Cereal Chem., 2 (1925), No. 2, pp. 68–86*).—The literature on the proteolytic enzymes of bakers' yeast and on methods of studying proteolysis in flour preparations is reviewed, and data are reported on the changes in physicochemical properties of flour suspensions in the presence of yeast.

The data show that reduction in water-imbibing capacity of gluten as measured by the viscosity of the flour suspension can not be attributed to the proteases contributed by the living yeast cells, but is due rather to increased H-ion concentration of the flour suspension undergoing fermentation. It is concluded that proteases of yeast are without effect upon the properties of gluten during a 4- or 5-hour fermentation period.

An extensive list of literature references is appended.

Macadamia nut and its oil, C. A. LATHROP (*Jour. Oil and Fat Indus., 2 (1925), No. 2, pp. 44–46*).—Analyses are reported of the meat, press cake, and pressed oil of the Macadamia or Queensland nut known in Australia as the bush nut or possum nut. The distribution of the constituents of the meat and press cake was as follows: Crude protein (N × 6.25) 8.6 and 35.6, crude fat (ether extract) 76.5 and 8, crude fiber 1.7 and 7, ash 1.9 and 7.7, nitrogen-free extract 8.2 and 33.7, and moisture 3.1 and 8 per cent, respectively. The pressed oil, which constitutes over 76 per cent of the edible portion of the nut and is said to be of delicate flavor and texture, had the following constants: Specific gravity at 15.5° C. 0.9141, refractive index at 15.5° C. 1.4698, saponification number 193.7, iodine number 74.2, unsaponifiable matter 0.32 per cent, acid value 0.22 and solidifying point—12.2° C.

The composition of mowrah-seed oil, A. H. GILL and C. C. SHAH (*Jour. Oil and Fat Indus., 2 (1925), No. 2, pp. 46, 47*).—The chemical constants of mowrah-seed oil or mowrah butter derived from the seeds of the *Bassia latifolia* widely distributed in India are reported as follows: Saponification number 206.5, iodine number (Hanus) 57.9, Reichert-Meissl number 0.7, Polenske number 0.9, acetyl number 3.3, acid number 14.15, and unsaponifiable matter 0.8. The distribution of the glycerides of the fatty acids in the oil is given

as follows: Clupanodonic trace, linolic 13.3, oleic 40.2, stearic 2, palmitic 26.6, and myristic acids 16.1, and unsaponifiable matter 0.8 per cent.

The chemical composition of California olive oil, G. S. JAMIESON and W. F. BAUGHMAN (*Jour. Oil and Fat Indus., 2 (1925), No. 2, pp. 40–44*).—Data on the chemical composition of olive oil from Mission olives are reported as follows: Glycerides of oleic acid 84.4 per cent, linolic 4.6, myristic trace, palmitic 6.9, stearic 2.3, and arachidic acids 0.1, and unsaponifiable matter 1 per cent.

Suitability of various solvents for extracting vanilla beans, III, J. B. WILSON and J. W. SALE (*Indus. and Engin. Chem., 17 (1925), No. 5, pp. 506, 507*).—Continuing the study previously noted (E. S. R., 51, p. 610), attempts were first made to prepare an extract by subjecting the beans to a preliminary extraction with carbon tetrachloride, followed by dilute alcohol. The resulting extracts were of inferior quality. Tests for aroma and flavor were then made of all the extracts prepared in the entire investigation. The tabulated data show that the most suitable solvent for vanilla extracts is neutral 65 per cent ethyl alcohol, followed in decreasing order by alkaline 65 per cent ethyl alcohol, 95 per cent ethyl alcohol, 91 per cent isopropyl alcohol, U. S. P. acetone, U. S. P. ether, and carbon tetrachloride.

The seed hairs of the milkweed, A. W. SCHORGER (*Indus. and Engin. Chem., 17 (1925), No. 6, p. 642*).—The composition of the seed hairs of the milkweed, *Ascelpias syriaca*, is reported to be as follows: Lignin 22.18, pentosans 34.55, methylpentosans 1.05, methoxyl 3.6, cellulose 60.4 α-cellulose in cellulose 58.64, soluble in alcohol 4.28, soluble in ether 1.35, and ash 0.97 per cent.

Influence of the thyroid gland on oxidation in the animal organism, E. C. KENDALL (*Indus. and Engin. Chem., 17 (1925), No. 5, pp. 525–534, figs. 9*).—In this Chandler lecture for 1925, the author discusses the effect of thyroxin on basal metabolism, the chemical nature of thyroxin, and the synthesis and physiological properties of compounds relating to thyroxin, and presents a working hypothesis to explain the action of thyroxin and similar compounds.

It is suggested that thyroxin acts as a catalyst, stimulating metabolic processes through alternate reactions of oxidation and reduction. The intensity of the reaction in the oxidative phase is increased by an intramolecular rearrangement, the closing of the pyrrolidone ring, which opens again after the reduction. It is considered probable that other substances, including adrenaline and bios, known to influence catalytically the metabolic rate may act in the same manner. The possibility is suggested that the crystalline bios isolated by Eddy (E. S. R., 53, p. 204) is δ-hydroxyl-γ-aminovaleric acid. In this compound, which agrees with the empirical formula reported by Eddy, oxidation of the hydroxyl group to aldehyde could be followed by enolization with the amine group.

A new type of color-comparator, H. S. BAILEY (*Jour. Oil and Fat Indus., 2 (1925), No. 1, pp. 8–14, fig. 1*).—In the type of color comparator described, which was devised to overcome some of the sources of error in determining the color of cottonseed oils by the ordinary Lovibond colorimeter, glasses of the Lovibond scale are used, but each color is made up by a combination of the same color glasses. The glasses are protected from dirt and scratches and are easily revolved, the total color is indicated in a straight vertical line upon four concentric dials, and a uniform light source is provided.

The K. and E. color analyzer, C. W. KEUFFEL (*Jour. Oil and Fat Indus., 2 (1925), No. 1, pp. 14–20, figs. 4*).—"The K. and E. color analyzer is a practical direct-reading spectrophotometer. It is used for determining the spectral transmission curves of all transparent substances, liquid or solid, such as

colored solutions, oils, glass, etc., also for determining the spectral reflection curves of solid substances such as paper, soap, flour, etc. These curves can then be used to form the basis for a system of color specification or color control."

Electrometric titration, J. C. Brünnich (*Indus. and Engin. Chem., 17 (1925), No. 6, pp. 631, 632, figs. 5*).—Following the suggestion of van der Meulen and Wilcoxon of the use of electrodes other than the hydrogen electrode in electrometric titration (E. S. R., 48, p. 709), the author carried out tests with other electrodes and found platinum and pure graphite to be the only satisfactory substitutes. A combined graphite and platinum electrode is described and illustrated, and data are reported on its accuracy.

A method for the determination of nitrates in fresh plant materials [trans. title], A. Shmuk (*Nauch. Agron. Zhur. (Jour. Landw. Wiss.), 1 (1924), No. 9–10, pp. 562–569, fig. 1*).—A colorimetric method for the determination of nitrates in fresh plant materials is described. This consists essentially in warming the finely divided material in water suspension in a water bath for 30 minutes, decolorizing the solution with alum and ammonia, evaporating to dryness, adding sulfophenol, and comparing the color with suitable standards in a color comparator.

Automatic devices for extracting alkaloidal solutions, S. Palkin, A. G. Murray, and H. R. Watkins (*Indus. and Engin. Chem., 17 (1925), No. 6, pp. 612–614, figs. 4*).—Several automatic devices for the extraction of solutions with immiscible solvents are described and illustrated by diagrams, with data as to their efficiency. These include a simple type of apparatus which is an improved form of the Baas and Boseman type, employing the same jacket, condenser, and boiling flask for light and heavy solvents, and two more complicated forms for solvents lighter and heavier than water and in which the solvent enters the aqueous solution wholly or partly in the form of vapor.

An apparatus for approximate or comparative melting points of fats, waxes, and petroleums, H. Stevens (*Jour. Oil and Fat Indus., 2 (1925), No. 1, pp. 28–30, fig. 1*).—A simple apparatus for routine work in the estimation of the melting points of fats is described and illustrated.

The apparatus consists of an ordinary hand-stirred melting point bath of paraffin oil, with thermometer and a short test tube provided with a two-hole stopper with a small groove on the side and fitted with a thermometer and a glass rod, with the lower end cut off square and left sharp. This is dipped into the melted sample to obtain a uniformly thin film about ½ in. in length. The stopper is placed in the tube and the tube immersed in the oil, which has been heated to 10° above the expected melting point of the sample. The temperature at which the film becomes transparent is noted as the softening point, and the temperature at which the film slides down the rod and forms a hanging drop on the end as the melting point.

Measurement of susceptibility of fats to oxidation, G. R. Greenbank and G. E. Holm (*Indus. and Engin. Chem., 17 (1925), No. 6, p. 624, fig. 1*).—An ingenious recording device for measuring the susceptibility of fats to oxidation by oxygen absorption is described and illustrated.

The detection of rancidity in fats and oils [trans. title], T. von Fellenberg (*Mitt. Lebensmtl. Untersuch. u. Hyg., Eidg. Gsndhtsamt. [Switz.], 15 (1924), No. 5, pp. 198–208*).—The test described is essentially the fuchsin sulfurous acid test for aldehydes, which can be used for the detection of rancidity, or by comparison with standard aldehyde solutions of known strength, for the quantitative determination of aldehydes in rancid fats.

Effect of sodium carbonate concentration in the Benedict sugar method, A. J. Quick (*Indus. and Engin. Chem., 17 (1925), No. 7, pp. 729, 730, fig. 1*).—

Data are tabulated on the effect of the concentration of sodium carbonate on the oxidizing power of Benedict's sugar reagent, as determined by varying the strength of the glucose solution and by adding varying amounts of water and of the sodium carbonate.

The data indicate that for concentrations of carbonate greater than 25 gm. per 100 cc. of the final solution the oxidizing value of the reagent is minimum and constant (1 cc. being equivalent to from 1.88 to 1.90 mg.), but that as the concentration decreases below this point the oxidizing value increases. That this is due to the hydroxyl-ion concentration rather than the sodium carbonate itself is thought to be established by the fact that a decrease in the glucose equivalent can also be brought about by increasing the alkalinity in other ways.

To increase the accuracy of the method it is recommended that enough of the anhydrous sodium carbonate be added to the reagent to maintain the concentration above the critical level of 25 gm. per 100 cc. of solution. "For glucose solutions stronger than 0.25 per cent it is best to use 25 cc. of Benedict's reagent and 10 gm. of anhydrous sodium carbonate, although 5 gm. are sufficient for glucose solutions stronger than 1 per cent. In titrating glucose solutions weaker than 0.25 per cent, 10 cc. of Benedict's reagent and 10 gm. of anhydrous sodium carbonate should be taken."

The detection and colorimetric determination of sucrose in the presence of other sugars [trans. title], H. Riffart and C. Pyriki (*Ztschr. Untersuch. Nahr. u. Genussmtl., 48 (1924), No. 3, pp. 197–207*).—A colorimetric method for determining sucrose in the presence of other sugars is described, with applications to condensed milk, zwieback, cakes, chocolate, and beer. The procedure depends upon the formation of a dark-colored caramel substance from levulose under the action of acids and its comparison with suitable standards.

A rapid quantitative method for determining the decolorizing power of carbons, D. S. Chamberlin and M. K. Buckley (*Jour. Oil and Fat Indus., 2 (1925), No. 1, pp. 4-8, figs. 2*).—The method consists essentially in treating a standard aqueous solution of potassium iodide and iodine with a definite amount of the carbon in question and determining by means of standard thiosulfate solution the quantity of iodine absorbed. The technique of the method is given, with data on its accuracy. The method is said to be rapid, and to be suitable for controlling the plant output of any kind of carbon without a size preparation and for comparing decolorizing carbons manufactured by different methods.

Jelly making from tropical fruits, J. C. Ripperton (*Hawaii Sta. Rpt. 1924, pp. 16, 17*).—A simplified method for testing the relative acidity of fruit juices in jelly making is described. The method consists essentially in the titration of the juice with 0.2 N sodium hydroxide, with phenolphthalein as indicator, using a Mohr pipette so marked that the relative acidity of the juice can be judged by the point at which the color of the solution changes when the fruit juice is dropped into the standard base from the pipette.

Removal of sulfurous acid from grape sirup, W. V. Cruess and E. W. Berg (*Indus. and Engin. Chem., 17 (1925), No. 8, pp. 849, 850, figs. 2*).—In this study of the comparative value of different methods of removing sulfurous acid from grape juice, a comparison was first made of the value of varying amounts of 3 per cent sulfurous acid and 10 per cent potassium metabisulfite, $K_2S_2O_5$, in preventing fermentation or molding of grape juice heavily inoculated with wine yeast and blue mold, and stored for two months. Fermentation appeared in from 5 to 7 days in the samples containing sulfurous acid

in concentrations up to and including those furnishing 1,000 mg. of total SO_2 per liter and in those containing potassium metabisulfite up to and including 750 mg. SO_2 per liter. The disappearance of SO_2 was more rapid from the juice containing sulfurous acid than from that containing the potassium metabisulfite. In uninoculated juice stored in sealed barrels, a concentration of SO_2 of 1,500 mg. per liter was found sufficient to prevent fermentation for at least 2 years. This juice contained at the end of 16 months' storage 736 mg. of total SO_2 and about 400 mg. of free SO_2 per liter, and was used for the desulfuring experiments.

The various methods for removing SO_2 which were tested included concentration in open pan and in vacuo, the passage of compressed air, unheated and heated, through the juice heated at various temperatures up to 80° C., the use of CO_2 in place of air, and steam at atmospheric pressure and in vacuo.

Concentration in an open pan to 70° Brix removed 73.8 per cent of the total SO_2 and in vacuo about 90 per cent. Compressed air removed the SO_2 more rapidly, the rate of removal being proportional to the temperature of *the liquid but not being affected by the temperature of the air. Carbon* dioxide was slightly more effective than air. Steam either at atmospheric pressure or under vacuum was the most effective of any of the agents used. For commercial use steam in vacuo is recommended as being the most rapid method and the one producing the least change in the flavor of the sirup.

Chemistry of the sulfite process: Studies of the acid hydrolysis of wood, R. N. MILLER and W. H. SWANSON (*Indus. and Engin. Chem., 17 (1925), No. 8, pp. 843–847, figs. 3*).—The studies reported in this paper are based upon the theory that the principal reaction involved in the sulfite pulping process is an acid hydrolysis of the wood. With this in mind, ground white spruce, previously extracted with a 2:1 mixture of benzene and alcohol, was subjected to mild hydrolysis with hydrochloric acid in a series of concentrations ranging from 0.05 to 3 per cent and the hydrolysate used for determinations of reducing sugars before and after a second hydrolysis with 3 per cent hydrochloric acid. The residue from the original hydrolysis was examined for cellulose and lignin.

Another portion of the ground spruce similarly extracted with benzene-lcohol was subjected to hydrolysis with sulfite cooking liquor in a special ıpparatus which is described and illustrated, and the hydrolysis products .nd residue were similarly analyzed. The results obtained are summarized .s follows:

"The same amounts of carbohydrate materials are removed from wood by mild hydrolysis with hydrochloric acid as are removed by sulfite digestion, which reduces the lignin content of the residue below 2 per cent. These arbohydrate materials are removed, in part at least, as complex bodies that an be further hydrolyzed to reducing sugars. The time of lignin removal y the sulfite reaction is reduced approximately one-half by each 10-degree ncrease in temperature between 120 and 150° C., and by a change in acid oncentration from 1 per cent to 3 per cent. The tendency of salts of strong cids added to the cooking liquor is to increase the rate of reaction, and for hose of weak acids to decrease the rate of reaction, suggesting a process ependent upon hydrogen-ion concentration."

Effect of presteaming on the hydrolysis of wood, E. G. SHERRARD and . O. GLOSS (*Indus. and Engin. Chem., 17 (1925), No. 8, pp. 847–849, fig. 1*).—In order to complete a study of the variables affecting the yields of sugar nd alcohol from wood by acid hydrolysis [E. S. R., 50, p. 8], wood was subjected to different periods of steaming both before and after the addition of

acid. In these experiments the diluted acid was injected into the digester under pressure without interrupting the digestion. Fermentations and alcohol determinations were made on the sugars thus produced in order to determine the effect of such conditions upon the yield of fermentable sugars.

"The results obtained indicate that a presteaming causes little or no increase in yields of total sugar. Longer steaming at 8 kg. or less after addition of the catalyst produces somewhat larger yields and at the same time produces a greater percentage of total sugar fermentable."

The highly reducing substances in fresh wood distillate, R. J. WILLIAMS, P. A. LASSELLE, and H. A. REED (*Indus. and Engin. Chem., 17 (1925), No. 8, pp. 851–853*).—In an attempt to determine the nature of the highly reducing substances which are present in fresh wood distillate but absent from the liquor after it has stood for some time, an oil boiling at from 130 to 205° C. at 20 mm. pressure was obtained to the extent of about 200 gm. from 2 liters of fresh distillate. From 12 to 16 per cent of this oil was found to consist of oil of very high reducing power and precipitable by lead acetate. "One of the important constituents of this oil appears to be 1-monomethyl ether of pyrogallol, and the homologues of pyrocatechol, as well as other *o*-dihydroxy phenols, are probably present.

"Old pyroligneous acid and tar contain very little of these highly reducing oils which are precipitated by lead acetate, and on heating the original high-boiling oils condensation takes place and the amount of these substances present decreases."

METEOROLOGY

A discussion on hygrometry (*London: Phys. Soc., [1921], pp. XCV, figs. 33*).—This is a report of a symposium on the subject of hygrometry, including the following formal papers: The Measurement of Atmospheric Humidity, by N. Shaw; Some Modified Forms of Hydrometers, by E. Griffiths; The Theory of the Hair Hygrometer and The Rationale of Glaisher's System of Hygrometry, both by F. G. W. Whipple; The Wet and Dry Bulb Hygrometer, by S. Skinner; Note on Psychrometry in a Wind Channel, by R. A. W. Watt; The Tilting Hygrometer: A New Form of Absorption Hygrometer, by H. G. Mayo and A. M. Tyndall; and A Thermal Hygrometer, by A. M. Tyndall and A. P. Chattock. The report also contains accounts of a general discussion of the subject and a bibliography of the more important papers bearing on the discussion.

On the question of day-to-day fluctuations in the derived values of the solar constant, C. F. MARVIN (*U. S. Mo. Weather Rev., 53 (1925), No. 7, pp. 285–303, figs. 7*).—This is a survey and critical study of the evidence for and against day-to-day and other variations in solar intensity, dealing especially with the accuracy of the Smithsonian Institution's daily determination of the solar constant in "a search for evidence as to what part, if any, of these and other short-period fluctuations should be ascribed to solar changes, and what part, if not all, must be assigned to the inevitable errors of derivation." The general conclusion reached is that "final definitive evidence, especially in quantitative measures, can not be secured from observations at a single station with only one set of observing instruments," and while a considerable number of synchronous observations at stations in pairs have beeen recorded, "unfortunately because of volcanic dust and other untoward circumstances, these synchronous values are so much affected by important accidental and systematic terrestrial and artificial causes as to more or less invalidate the evidence which these observations might show of a small possible variation, which can be enter

tained as real only when confirmed by future independent observations at other stations."

Smithsonian solar-constant values, H. H. KIMBALL (*U. S. Mo. Weather Rev., 53 (1925), No. 7, pp. 303–306, figs. 3*).—Considering briefly "the magnitude of errors in solar constant determinations arising from errors in the fundamental pyrheliometric readings and in their extrapolation to zero atmosphere," the author states that "the degree of correlation between solar constant determinations made nearly simultaneously at Montezuma, Chile, and Harqua Hala, Ariz., leads to the conclusion that only an insignificant part of their day-to-day variations can be attributed to some such common cause as solar variability."

A statistical analysis of solar radiation data, H. W. CLOUGH (*U. S. Mo. Weather Rev., 53 (1925), No. 8, pp. 343–348, fig. 1*).—As a result of his analysis the author reaches the conclusion "that the fluctuations of all day-to-day and even monthly and yearly mean values of the solar constant are so unmistakably correlated with the transparency of the atmosphere, with its water vapor content and seasonal characteristics, that they can not be regarded as even approximate values of real changes in solar intensity."

A mathematical inquiry into the influence of the amount and distribution of rainfall on the yield of corn, T. K. WOLFE (*Jour. Amer. Soc. Agron., 17 (1925), No. 6, pp. 356–362, figs. 2*).—A study of the relationship between the yield of corn and the rainfall and the influence of fertilizers on this relationship was made at the Virginia Experiment Station under conditions of rainfall which have varied for the crop season, April to September, inclusive, during the past 15 years from 17.67 in. in 1917 to 39.05 in. in 1918. The corn was grown on a silt loam soil in a 4-year rotation of corn, wheat, and grass and clover. Fertilizers and manure were used annually on all of the crops. For a part of the period of study a corn silking about August 1 was used; for the rest of the period one silking August 15 was used.

Under these conditions it was observed that if the entire corn year is considered an increase in rainfall within limits is accompanied by an increase in the yield of corn. Study of the rainfall of the different months of the corn year with reference to yield indicates that alternate wet and dry periods are very favorable to corn production. A low rainfall in May and July accompanied by a high rainfall in June and August seems conducive to a high yield of corn. Ample rainfall before earing time, in June, is apparently very beneficial to corn production, as is abundant rainfall during earing time, in August.

Development and present status of frost-fighting devices, F. D. YOUNG (*U. S. Mo. Weather Rev., 53 (1925), No. 8, pp. 349–351, pls. 2*).—The author sums up this review of the construction and operation of some of the newer types of frost-fighting devices with the statement that "the orchard heater is to-day the only practical means of obtaining complete protection from low temperature in orchards, but constant effort is being directed toward finding some more satisfactory method."

Value of smudge-pots in preventing frost in cranberry bogs, R. A. WELLS and P. PARKER (*Abs. in U. S. Mo. Weather Rev., 53 (1925), No. 8, pp. 351–352*).—This is a summary by F. D. Young of a report on experiments at North Head, Wash., which "indicate that it is practicable to protect cranberries from frost damage by the use of orchard heaters at a reasonable cost. It is believed that as good or better results can be secured in protecting other low-growing crops, using the same methods."

Monthly Weather Review, [July–August, 1925] (*U. S. Mo. Weather Rev., 53 (1925), Nos. 7, pp. 285–335, pls. 6, figs. 11; 8, pp. 337–378, pls. 12, figs.*

14).—In addition to detailed summaries of meteorological and climatological data and weather conditions for July and August, 1925, and bibliographical information, notes, abstracts, and reviews, these numbers contain the following contributions:

No. 7.—On the Question of Day-to-Day Fluctuations in the Derived Values of the Solar Constant (illus.), by C. F. Marvin (see p. 114); Smithsonian Solar-Constant Values (illus.), by H. H. Kimball (see p. 115); The Probable 24-Hour Temperature Change (7 a. m. to 7 a. m.) at Montgomery, Ala. (illus.), by J. W. Smith and W. R. Stevens; Two Waterspouts in Mobile Bay, June 12, 1925, by A. Ashenberger; Cirro-cumuli and Thunderstorms, by R. M. Dole; and Are Present Methods of Rainfall Insurance Sound? by C. H. Eshleman.

No. 8.—An Analysis of Free-Air Observations in Their Relation to Precipitation (illus.), by V. E. Jakl; A Statistical Analysis of Solar Radiation Data (illus.), by H. W. Clough (see p. 115); Temperature and Humidity of the Upper Air at San Diego, Calif., by B. H. Wyatt; Development and Present Status of Frost-Fighting Devices (illus.), by F. D. Young (see p. 115); Value of Smudge-pots in Preventing Frost in Cranberry Bogs (illus.), by R. A. Wells and P. Parker, abs. by F. D. Young (see p. 115); Sampling the Higher Atmosphere, by W. J. Humphreys; and papers read at the Portland, Oreg., meeting of the American Meteorological Society, June 18, 1925; Wide Area Forecasting of Streamflow on the Columbia and Colorado, by J. E. Church; The Climate of British Columbia, by F. N. Denison; The Climate of Oregon during the Pleistocene Period, by E. T. Hodge (abs.); Variability of Precipitation in the State of Washington, by M. B. Summers (abs.); and Floods in the Willamette River, by E. L. Wells (abs.).

Climatological data for the United States by sections, [July–August, 1925] (*U. S. Dept. Agr., Weather Bur. Climat. Data, 12 (1925), Nos. 7, pp. [190], pls. 4, fig. 1; 8, pp. [189], pls. 4, fig. 1*).—These numbers contain brief summaries and detailed tabular statements of climatological data for each State for July and August, 1925.

Chronicle of meteorological events in Belgium up to 1834, E. Vanderlinden (*Chronique des Événements Météorologiques en Belgique jusqu'en 1834. Brussels: Acad. Roy. Belg., 1924, pp. 329; rev. in Nature [London], 116 (1925), No. 2911, p. 239*).—Beginning with the rainy summer of A. D. 120 and continuing up to the beginning of regular meteorological observations at Brussels in 1834, this record deals with severe and mild winters, hot and dry and cold and rainy summers, heavy rains and floods, storms and hurricanes, late and early frosts, and miscellaneous phenological phenomena. Most of the events recorded are primarily of agricultural interest.

SOILS—FERTILIZERS

Soils, A. J. Werth (*Bodenkunde. Berlin: Paul Parey, 1924, pp. 64, figs. 43*).—This is No. 11 of the Gardening Textbook Series, edited by A. Janson, and deals with the scientific phases of soils, taking up in order soil formation, humus and soil microorganisms, origin and properties of different soils, soil improvement, the physics and chemistry of soils, and soil cultivation.

The sands and sand soils in Latvia, J. Vītiņš (Wityn) (*Latvijas Smiltis un Smilts Zemes (Die Sande und die Sandböden in Lettland). Riga: Forst-Dept. Landw. Min., 1924, pp. 157, pls. 3, figs. 50*).—Studies of the sands and sand soils of Latvia to determine their content of plant nutrients and the influence of cropping on them are reported. It is stated that these soils comprise about one-third of the entire area.

It was found that these sand soils contain less potassium and sodium than similar soils in Finland and Petrograd Province, and the total lime content is apparently also less. At the higher elevations the phosphoric acid content of these soils averages about 0.05 per cent and it increases at lower elevations.

A German abstract is included (pp. 123–157).

Texture of quaternary silts and of the soils derived from them [trans. title], A. Demolon (*Compt. Rend. Acad. Sci. [Paris], 180 (1925), No. 10, pp. 754–757*).—Mechanical analyses of samples of three levels of the quaternary silts in the northern Oise Department of France are presented and discussed. All three strata are of similar mechanical composition, with particular reference to the absence of coarse materials, to the presence of around 75 per cent of silty material, and to their feeble adhesive properties and the homogeneity of their surface composition.

The agricultural soils derived from the so-called brick silt strata are distinguished by the absence of clay materials. These soils are easily deflocculated by rain action, resulting in the removal of the finer material.

The clays of the Lake Agassiz basin.—I, Their colloidal content, R. C. Wallace and J. E. Maynard (*Roy. Soc. Canada, Proc. and Trans., 3. ser., 18 (1924), Sect. IV, pp. 9–30, pl. 1, figs. 7*).—Studies of the Lake Agassiz clays are reported, indicating that the sections in the Winnipeg area consist of soil, sand to sandy clay, lake clay, friable and bedded material, yellow sandy clay, and fine bedded dark gray clays. The greatest variation occurs in the upper sandy clay, which is probably river deposited. The lower yellow clay shows very little variation. The upper and lower bedded clays are true lake deposits, laid down at great depths in the glacial lake. There has been practically no leaching of the clays since deposition.

The yellow sandy clays contain less colloidal material than either the gray silty clays above or the dark gray, finely laminated clay below. The colloidal content of the clays investigated, with the exception of the yellow sandy clays, increases with their depths. These colloids were deposited at the time the clays were laid down. Temperatures up to 110° C. (230° F.) were found to have no appreciable effect on the colloids in the clay.

The rate of absorption of moisture by the clays from a moist atmosphere was found to depend upon the amount of colloids in the clays and the quantity of moisture already contained. The maximum rate of absorption was found to take place at the exact instant the dried clay was brought into contact with the moist atmosphere, and from that moment until the final value was reached the rate gradually decreased. The yellow sandy band had the least total and free water capacity, while the total and free water capacity of all the other clays increased with depth. The colloidal factor was found to be of minor importance in the slipping of the yellow sandy clays beneath heavy structures.

The physical significance of the shrinkage coefficient of clays and soils, F. Hardy (*Jour. Agr. Sci. [England], 13 (1923), No. 3, pp. 243–264*).—Studies conducted at the West Indian Agricultural College on the significance of the shrinkage coefficient of clays and soils are reported.

It was demonstrated that soils of similar colloid content and belonging to the same geological type, but exhibiting different degrees of aggregation, possess similar shrinkage coefficients. The hypothesis accepted to explain soil shrinkage was based on the belief that colloidal gels possess a reticulate structure. At the point of saturation a hydrogel probably contains water in two phases, the first of which is absorbed in the walls of the gel and the

second of which fills the vesicles of the gel and is a crystalline phase. It was demonstrated that shrinkage in clays and soils is due solely to loss of vesicular water. It was further found that accurate values for the hydrographic coefficient of soils can not be calculated from observed shrinkage coefficients.

Variations in the shrinkage coefficients of soils of similar colloid content but belonging to different geological types are considered to be probably due to specificity in soil colloids. This manifests itself chiefly in differences in the ratio of adsorbed water to vesicular water. Red lateritic soils rich in alumina hydrogel appeared to possess relatively low vesicular water contents, and in consequence exhibit low shrinkage coefficients.

The physical basis of the assumption that the water content at the point of maximum plasticity represents the imbibition capacity of a clay or soil is discussed in the light of modern theories of plasticity, and is provisionally accepted as marking an important stage in the water relations of clays and soils.

An extensive bibliography is included.

Do relations exist between the colloidal alumina and silicate portions of soils soluble in hydrochloric acid and their fertility and fertility requirements? [trans. title] R. Ganssen (*Internatl. Mitt. Bodenk., 14 (1924), No. 1-2, pp. 55-72*).—Experiments with certain neutral and alkaline marsh soils are reported, the results of which are considered to confirm the theory that the fertility and fertilizer requirements of soils may be determined by means of the molecular relationship existing between the silica, the alumina, and the bases in soil colloidal material extracted by hydrochloric acid.

Distribution of fertility in arable strata according to depth [trans. title], A. Lebediantzeff (*Compt. Rend. Acad. Sci. [Paris], 178 (1924), No. 16, pp. 1381-1383*).—Studies are briefly reported showing that the greater supplies of available fertility occur in the surface layers of soil, and that they decrease with the depth. This is attributed to the more extensive and rapid air drying of the surface soil.

Portable apparatus for the electrical determination of soil moisture in the field [trans. title], G. Gönz (*Internatl. Mitt. Bodenk., 14 (1924), No. 1-2, pp. 35-39, pl. 1*).—A portable apparatus is described which permits the determination of the soil moisture by measurement of the electrical conductivity. The apparatus is arranged to deal with moisture ranges from 5 to 25 per cent. The measurement depends upon the fact that the different factors which influence conductivity, with the exception of water content, are excluded. The quotient of resistance of a constant and a variable current in the same soil sample is constant and proportional to the specific conductivity.

With uniform temperature and water content, the soil resistance decreases with an increase in the density of stratification, but remains constant when the density of stratification exceeds a pressure resistance of 3 kg. per square centimeter (42.6 lbs. per square inch).

Total absorption capacity of soil and the stability of the absorbent complex [trans. title], D. Prianichnikov (*Ann. Sci. Agron. Franç. et Étrang., 42 (1925), No. 3, pp. 161-166*).—Studies are reported which showed that the treatment of soil with barium chloride permits the determination of its total absorption capacity, as indicated by the quantity of barium retained by the soil in an absorbed state. It also indicates the stability of the absorbent complex of different soils. Soil of humid regions was distinguished by a greater stability of its absorbent complex than that of chernozem soil. Artificial zeolite contained a very unstable absorbent complex.

Degradation and the podsolizing process [trans. title], K. Glinka (*Internatl. Mitt. Bodenk., 14 (1924), No. 1-2, pp. 40-49*).—Studies are reported which

showed that the degradation of forest chernozem soils into podsol soils is due to the excessively moist conditions accompanying forest vegetation. The calcium carbonate is leached out of the humus in the surface strata, and the humus passes into solution and is carried to the subsoil together with the finest materials, which are rendered dispersible.

Microscopic study of soil [trans. title], S. WINOGRADSKY (*Compt. Rend. Acad. Sci. [Paris], 179 (1924), No. 7, pp. 367–371*).—An improved method for making microscopic studies of soil organisms is described.

Microbiological studies of frozen soil, A. G. LOCHHEAD (*Roy. Soc. Canada, Proc. and Trans., 3. ser., 18 (1924), Sect. V, pp. 75–96, figs. 6*).—In a contribution from the Central Experimental Farm, Ottawa, studies are reported in which bacteria were found in large numbers in frozen soil. While the counts obtained showed a slightly upward trend, no phenomenal increases were observed which pointed to a stimulation by frost. There was no indication of a rise of organisms from lower unfrozen levels to the frozen surface layers.

While the moisture content was in general parallel to the bacterial counts, especially at the lower levels, exceptions to this at the 2-in. level indicated that moisture was not the controlling factor. At the end of the period of frost with the thawing of the soil, a large increase in count appeared at the upper levels, followed later by a decrease in numbers to a point well above the winter averages.

As far as could be determined by the microscope, no change in the average number of individuals per group could be observed throughout the winter. Actinomycetes remained stationary in numbers or showed slightly increased plate counts. They had a higher average optimum temperature than soil bacteria, and are regarded as inactive in winter soils. Fungi counts by the plate method showed a notable increase at all depths studied throughout the winter, which is, however, taken to indicate increased spore production rather than enhanced vegetative activity at the lower temperatures. Protozoa decreased in numbers at the upper level throughout the frozen period, while no change was observed at the lower depths. After thawing at the end of the winter, marked increases were noted at the 2- and 6-in. levels. The great majority of soil bacteria were found to be incapable of development at low temperatures.

There was no increase throughout the winter in the relative numbers of colonies from frozen soil plates developing at low incubation temperatures to those on plates of higher incubation temperatures, thus pointing to the absence of a typical winter flora. Those organisms capable of growth at low temperatures were found to be inactive when the soil is frozen, becoming active only when the soil is in the unfrozen state.

The great majority of the soil bacteria capable of low temperature growth were found to be small rods and micrococci, which are not truly psychrophilic organisms but grow better at moderate temperatures. The bacteria of frozen soils are therefore regarded as cold enduring rather than psychrophilic in the true sense.

Influence of soil reaction upon the distribution of filamentous fungi in the soil, S. A. WAKSMAN (*Ecology, 5 (1924), No. 1, pp. 54–59*).—Studies conducted at the New Jersey Experiment Stations are reported which showed that the development of fungi in the soil is stimulated by the use of fertilizers which tend to increase the soil acidity. The application of lime and fertilizers to acid soils, tending to make the soil reaction less acid, were found to bring about a diminution in the number of soil fungi.

Influence of culture media on the counting of soil protozoa [trans. title], J. FRANÇOIS-PERET (*Compt. Rend. Acad. Sci. [Paris], 180 (1925), No. 4,*

pp. 315–317).—Studies are briefly reported from which the conclusion is drawn that culture media for the counting of soil fauna should correspond closely with the solution of the soil to be examined, on the theory that the solution peculiar to a certain soil must favor the growth of certain species more or less.

Influence of solar light on the development of a soil protozoa, Colpoda **cucullus** [trans. title], J. François-Perey (*Compt. Rend. Acad. Sci.* [*Paris*], *179* (*1924*), *No. 3, pp. 232–234, fig. 1*).—Studies are reported which showed that the growth of *C. cucullus* in cultures exposed to the rays of the sun was markedly diminished, while a normal growth occurred in cultures not subjected to sunlight.

The nitrogen-fixing power of Azotobacter [trans. title], E. Kayser (*Chim. et Indus.* [*Paris*], *Spec. No., May, 1924, pp. 694–704*).—The author traces the history of studies by himself and others on nitrogen fixation by Azotobacter, and draws attention to the influence of environmental factors such as moisture, temperature, light, aeration, reaction, and nutrition on this phenomenon.

Method for determining the nitrogen-fixing power of soil [trans. title], S. Winogradsky (*Compt. Rend. Acad. Sci.* [*Paris*], *180* (*1925*), *No. 10, pp. 711–716*).—The defects of existing methods are pointed out, and a new method is briefly described, the results of tests of which indicate that it permits the determination of the presence or absence of Azotobacter, their relative numbers, and the fixation of nitrogen from mannite as a measure of their fixing action corresponding to their multiplication.

Urea production during ammonification by Microsiphones [trans. title], G. Guittonneau (*Compt. Rend. Acad. Sci.* [*Paris*], *178* (*1924*), *No. 16, pp. 1383–1385*).—Studies are reported showing that two out of four species of soil Microsiphones are capable of producing urea from a solution containing peptone. It is thought that this may result in important losses of gaseous nitrogen, since the urea is rapidly transformed into ammonium carbonate in soils.

Presence of nitrates in forest soils [trans. title], A. Němec and K. Kvapil (*Compt. Rend. Acad. Sci.* [*Paris*], *180* (*1925*), *No. 19, pp. 1431–1433*).—Studies of the nitrogen content of both organic and mineral forest soils showed that the nitrate content of the humus of spruce soils decreases as the age of the trees increases. The humus and the covering of dead leaves are relatively rich in nitrates, and the dead covering of young ash undergrowth is sometimes very rich in nitrates. The soils growing a mixture of spruce and beech were found to contain more nitrates than soils in the same locality growing spruce alone.

Formation of hyposulfites from sulfur by soil microorganisms [trans. title], G. Guittonneau (*Compt. Rend. Acad. Sci.* [*Paris*], *180* (*1925*), *No. 14, pp. 1142–1144*).—Experiments are briefly reported which showed that different soil microorganisms are capable of oxidizing elementary sulfur to the hyposulfite form.

Influence of humus acids on the life of microorganisms in moor soil and methods for determining acidity [trans. title], T. Arnd (*Ztschr. Pflanzenernähr. u. Düngung, 4* (*1925*), *No. 1–2, Wiss., pp. 53–72, figs. 3*).—Ammonification, nitrification, and denitrification studies of upland and lowland moor soils to determine the extent of the injury of humus acids to plants and the best methods for establishing the amounts of acids in soils which injure plants are reported.

The ammonification experiments with an only slightly decomposed moss peat, heather humus, and a well decomposed lowland moor soil showed that ammonification proceeded more or less rapidly in all three soils, and reached

a maximum in neutralized soil and in soil receiving an excess of calcium carbonate.

Denitrification also reached a maximum in neutralized soil, but excessive liming caused no noteworthy increase in microbial activity. It is concluded in this connection that the acidity of the moss peat acids is the greatest, followed in order by that of the heather humus and lowland moor soil acids. The beginning of nitrification in these soils was found to correspond with their neutralization.

The results as a whole are taken to indicate the usefulness of the Tacke-Süchting method for determining the acidity of soils (E. S. R., 21, p. 9).

Solubilization of natural phosphates in soil humus acids [trans. title], C. Brioux (*Chim. et Indus. [Paris], Spec. No., May, 1924, pp. 691–693*).—Tests of the dissolving influence of an acid humus soil, rich in nitrogen and deficient in potash and lime, on natural phosphates are briefly reported.

It was found that within a period of three months 52 per cent of the natural phosphate applied in large amounts to this soil was rendered soluble in ammonium citrate, presumably in the form of so-called humophosphate. In similiar tests in slightly acid and slightly alkaline silty soils deficient in humus, the solubilization of natural phosphates was much less marked, while that of phosphates soluble in citric acid was relatively high.

These results are taken to indicate that natural phosphates are transformed in noncalcareous soils the more rapidly as the soil increases in humus content or acidity, although such transformation does take place in neutral and slightly alkaline soils.

Relation between absolute air capacity and degree of acidity of forest soil [trans. title], K. Kvapil and A. Němec (*Compt. Rend. Acad. Sci. [Paris], 179 (1924), No. 22, pp. 1283, 1284*).—Studies are reported which showed that the absolute air capacity of deciduous forest soils is lower than that in coniferous forest soils and decreases as the acidity of the soil increases. Fir and spruce soils were more acid than deciduous forest soils. The relation between absolute air capacity and acidity was found to be less marked on mixed forest soils, although the former is usually high.

Investigations of soil acidity questions by means of vegetation experiments [trans. title], H. Kappen (*Ztschr. Pflanzenernähr. u. Düngung, 4 (1925), No. 4, Wiss., pp. 202–214*).—The results of experiments on the behavior of plants in the presence of hydrolytic and exchange acidities in soils, with special reference to their susceptibility thereto, and on the influence of fertilization on exchange acidity are briefly summarized. The influence on acidity of fertilization with such salts as ammonium sulfate is brought out, and emphasis is placed on the importance of using combinations such as ammonium sulfate and superphosphate, which, while physiologically acid, do not increase the soil acidity if mixed in proper ratios, such as 3 parts of acid phosphate to 2 parts of ammonium sulfate. Such a combination not only did not affect the soil reaction, but its increased use resulted in a decrease in the acidity.

Lime requirement of soil from the plant physiology viewpoint.—II, Soil reaction and the growth of higher plants [trans. title], O. Arrhenius (*Ztschr. Pflanzenernähr. u. Düngung, 4 (1925), No. 1–2, Wiss., pp. 30–52*).—In a second contribution to the subject (E. S. R., 51, p. 814), the author summarizes a large amount of work by himself and others on the influence of soil reaction on crop growth, including the results of laboratory and field experiments.

It is shown that each plant variety has definite reaction requirements. Some varieties prosper under the influence of a wide range of reactions, while others are limited to special ranges, some have two reaction maxima, and

others only an optimum reaction. It is considered probable that the action of the degree of acidity can be divided into the influence of hydrogen and hydroxyl ions.

Soil reaction was found to influence the profitableness as well as the quality of crops. Ash analyses of some crops showed great variations in both ash content and the composition thereof. The assimilation of salts from soils by crops was found to be no greater in the presence of an acid reaction than of an alkaline reaction, although such assimilation was not independent of the greater solubility of the soil solution. Unfavorable soil reactions were found to be accompanied by nonparasitic diseases such as chlorosis.

It is believed that the cause of the great variations in the prosperity of crops with reference to soil reaction may rest in a relation between the external and internal reactions of the cell sap.

An extensive bibliography is included.

Lime requirement of soil, III, IV [trans. title], O. ARRHENIUS (*Ztschr. Pflanzenernähr. u. Düngung, 4 (1925), No. 6, Wiss., pp. 348–358; 5 (1925), No. 3 Wiss., pp. 195–199, pls. 5*).—A continuation of the above.

III. *Influence of soil reaction on the biological, physical, and chemical factors of soil.*—Data are presented indicating the influence of reaction and liming on soil factors, and showing that where the conditions are improved for one factor they may be made unfavorable to another factor. It is concluded, therefore, that the direct action of reaction on higher plants must be considered rather than on individual soil factors.

IV. *Use of soil reaction investigations in practice.*—Information on the practical use of the results of soil reaction investigations is presented, with particular reference to the requirements of different crops.

The influence of sulfur and gypsum upon the composition and yield of legumes, J. R. NELLER (*Washington Col. Sta. Bul. 190 (1925), pp. 5–47, figs. 10*).—Studies of the effect of sulfur and gypsum upon the composition and yield of alfalfa and clover in three predominating soil types of eastern and east-central Washington are reported. The work included plant house experiments as well as analyses and cropping experiments under natural climatic conditions at Pullman and Lind, and under irrigated conditions at Prosser.

When supplied with sufficient moisture, plant house yields of alfalfa were increased markedly when grown on very fine sandy loam soil treated with sulfur. In all cases the yields increased by the use of sulfur and gypsum contained an appreciably greater percentage of nitrogen. Similar experiments with clover grown on loam soil were much the same as those with alfalfa, except that both sulfur and gypsum increased the clover yields even more than those of alfalfa.

Field plat yields with alfalfa from the loam soil were increased by the use of sulfur, but to a lesser extent than in the plant house. Alfalfa and clover grown on silt loam responded slightly to sulfur and gypsum in plant house tests, but no consistent responses were shown by alfalfa in field tests. Alfalfa and clover gave a significant increase in growth on fine sandy loam soil treated with sulfur under plant house conditions, which was, however, less marked than that obtained with silt loam soil.

Sulfur proved to be more effective when used as a top-dressing in the surface layer of alfalfa sod than when mixed with the surface soil before planting. The results are taken to indicate that the added sulfur and gypsum are equally effective, and that a choice between the two should depend upon their relative costs.

In addition to its effect on the nitrogen content, sulfur also caused a marked increase in the sulfur content of those legume crops which were markedly increased in yield.

Analyses of alfalfa grown in silt loam soil under plant house and field conditions showed that while the field crop contained larger amounts of nitrogen and sulfur, the potassium, calcium, and phosphorus contents were about the same.

It is concluded that when sulfur and gypsum are needed they should be applied at rates of about 75 and 200 lbs. per acre, respectively.

The use of concentrated fertilizers, A. B. Beaumont (*Massachusetts Sta. Circ. 72 (1925), pp. 4*).—Tests conducted with tobacco, sweet corn, potatoes, beets, and hay, using concentrated complete fertilizers on all crops except hay in comparison with home-mixed fertilizers of half the concentration are briefly reported.

The results indicated that there was a slight reduction in stand in the case of two of the five crops grown when the concentrated fertilizers were applied either in the row or broadcast, but especially when applied in the row. It was found, however, that this initial reduction in stand was no handicap to the yield of the crops. The differences in yields were so small that no particular significance was attached to them. It is concluded that high-analysis concentrated fertilizers, such as those used, may be safely used, provided they are reasonably well mixed with the soil.

Fertilizing cereal crops in Ohio, C. E. Thorne (*Ohio Sta. Bimo. Bul., 10 (1925), No. 8, pp. 154, 155*).—Data are briefly summarized which indicate that on a basis of a 3-year rotation of corn, wheat, and clover, acid phosphate has been used with profit on every crop and on every soil except the black land of Paulding County, on which it has been used profitably for wheat. Potash has given a much larger increase in western than in eastern Ohio, and liming the land has increased the effect of potash in eastern Ohio. Nitrogen in sodium nitrate has given a small profit in eastern Ohio, but has generally been used at a loss in Western Ohio. Ground limestone has been used with profit on every eastern Ohio soil, but in western Ohio its cost has been recovered only on the oldest soils.

AGRICULTURAL BOTANY

Botany: Principles and problems, E. W. Sinnott (*New York and London: McGraw-Hill Book Co., 1923, pp. XIX+385, pl. 1, figs. 240*).—This book, the outgrowth of experience in teaching elementary botany to college freshmen, aims to set forth concisely the more important facts of morphology, physiology, classification, and distribution of plants, and to provide a body of stimulating and profitable problem material.

The food plants of the Philippines, P. J. Wester (*Philippine Bur. Agr. Bul. 39 (1924), 3. rev. ed., pp. X+236, pls. 67, fig. 1*).—This edition is said to have been preceded by one in 1916, and a revision of that dated 1921, to which have been added 88 species of plants and about 270 new dialectal names. The present list of Philippine food plants is, however, regarded as still incomplete. Analyses are given of Philippine food materials, and directions for keeping vegetable and other seeds and for the preparation and packing, for transportation, of native seeds and scions.

Physiology of nutrition in higher plant parasites [trans. title], T. Nicoloff (*Rev. Gén. Bot., 35 (1923), Nos. 419, pp. 545–552; 420, pp. 593–601*).—

Parasitic plants here dealt with include chiefly as chlorophyll bearers *Viscum album* on apple trees and *Loranthus europaeus* on oak; as chlorophyll-less, *Orobanche ramosa* on tobacco and *Cuscuta europaea* on *Sambucus ebulus*. Comparative analyses are reported.

The relation between the physical state of protoplasm and its functioning.—I, Photosynthesis [trans. title], R. WURMSER and R. JACQUOT (*Bul. Soc. Chim. Biol., 5 (1923), No. 4, pp. 305–315, fig. 1*).—Heating for two minutes at temperatures between 35 and 45° C., according to species, suppresses chlorophyll assimilation, although respiration continues.

[**Photosynthesis: Its mechanism, efficiency, and problems**] (*Brit. Assoc. Adv. Sci. Rpt., 90 (1922), pp. 395, 396, Addend. p. 396*).—In a joint meeting of the association sections of botany and chemistry, discussion was given of The Biochemical Problems of Chloroplastic Photosynthesis, by F. F. Blackman; Photosynthesis, by E. C. C. Baly; The Efficiency of the Photosynthetic Mechanism of Green Plants for Different Wave-lengths of Incident Radiation, by G. E. Briggs; Some Speculations on the Photosynthesis of Plant Products, by I. M. Heilbron and C. Hollins; Photosynthesis from the Energy Aspect, by F. C. Eve; and Photosynthesis: Electric Energy, by M. C. Potter.

The respiration of green plants in light.—[I, General]. II, Interpretation of the experiments of Garreau [trans. title], R. CERIGHELLI (*Bul. Soc. Bot. France, 71 (1924), Nos. 3–4, pp. 251–256; 5–6, pp. 653–656*).—The author has given attention to the related work of predecessors, particularly that of Garreau,[1] and he concludes that green plant cells do not give off carbon dioxide under conditions favorable to assimilation. In light, all the gas formed by respiration is immediately decomposed, under ordinary (natural) conditions, by photosynthesis; if a small quantity may sometimes be obtained, this is due, it is claimed, to its formation in cells lacking chlorophyll, or under conditions of diminution, as by traumatism, of assimilatory intensity.

In order to explain the results obtained by Garreau, the author continued these studies. He concludes that green tissue brought under illumination at temperatures below 30° C. (86° F.), does not give off carbon dioxide, all of that gas produced by respiration being decomposed by photosynthesis. The separation of carbon dioxide noted by Garreau has its origin in nonassimilating (chlorophyll-less) tissue, or tissue in which respiration is excessive as compared with assimilation, as in branches, petioles, epidermis, or decaying cells. It appears that only at high temperatures has respiration of green tissues been proved to occur.

Influence of the character of nitrogen nutrient on gaseous exchanges [trans. title], M. MOLLIARD (*Rev. Gén. Bot., 35 (1923), No. 409, pp. 6–23, figs. 2*).—The conclusions from early researches of Schlösing (E. S. R., 4, p. 678), to the effect that output of oxygen was apparently in excess of the intake thereof from supply sources in his plant cultures, having been verified by the present author with radish and with *Sterigmatocystis nigra* (E. S. R., 37, pp. 25, 223), he has extended his studies to cultures of the unicellular green alga *Stichococcus bacillaris* and the fungus *Isaria densa*.

It is stated that nitrates and sodium urate augment the respiratory quotient of both autotrophic and heterotrophic plants, as well as the intensity of intramolecular respiration. This action is catalytic in its nature.

Asparagine, leucine, and glycocoll constitute for *I. densa* a complete organic nutrient. Egg albumin acts as an aliment complete as to both mineral and organic content for *I. densa*, and this, as is the case with other protein substances, is more drawn upon in the absence than in the presence of sugar.

[1] Ann. Sci. Nat., Bot., 3. ser., 15 (1851), pp. 5–36; 16 (1851), pp. 271–292.

Athermancy of plant essential oils and transpiration [trans. title], E. C. Téodoresco (*Rev. Gén. Bot., 35 (1923), Nos. 416, pp. 382–398, figs. 6; 417, pp. 455–464, figs. 5; 418, pp. 509–519, figs. 6; 419, pp. 566–575, figs. 2*).—Studies carried on by methods utilizing a potometer with different plants kept in spaces completely or incompletely inclosed are said to show that essential oils in plants diminish transpiration. This effect is due to the influence of the essential oils on the activity of the protoplasm and appears in effect as a lowering of the permeability of the protoplasmic membranes. The athermancy of the oils does not in itself appreciably lower transpiration.

A note on the statistics of cyclic growth, H. S. Reed (*Natl. Acad. Sci. Proc., 9 (1923), No. 3, pp. 65–67, fig. 1*).—"The quantitative study of growth and differentiation in plants has shown some very definite stoichiometrical relationships, which support the assumption that growth processes lead to a quantitative distribution of matter in space. The writer has made a study of the relations between the length of lateral shoots and their position on young branches of the apricot tree, and has found certain definite relationships which throw some light upon the unity of growth processes in organisms."

A graphical and descriptive account of this work is briefly presented.

The endodermis: A study in causal anatomy, J. H. Priestley (*Abs. in Brit. Assoc. Adv. Sci. Rpt., 90 (1922), p. 400*).—The development of the primary endodermis behind the root growing-point appears to be causally connected with (1) the fat metabolism of the apical meristem, (2) the changes proceeding in the membranes of the meristematic cells, and (3) the diffusion of substances from the differentiating phloem. The appearance of the secondary endodermis in the root is to a certain extent under experimental control. The appearance of a secondary endodermis in the stem is not necessarily preceded by any primary stage. The conditions under which the secondary endodermis appears in the stem are reviewed, with special reference to *Rubus idaeus* and *Camellia japonica*.

Fruit anomalies and resistance to saltness in Lepidium sativum [trans. title], P. Lesage (*Rev. Gén. Bot., 35 (1923), No. 413, pp. 209–212*).—The author reports that plants grown in salted water show weaker stature and smaller and lighter seeds than do the control plants. These characters due to saltness show a certain persistence in descendants grown in ordinary water. Anomalous fruits are obtained from plants under salted conditions and particularly from such plants derived from parents subjected to these conditions. Plants grown under saline conditions acquire a certain resistance to saltness.

GENETICS

Genetics, W. Bateson et al. (In *Imperial Botanical Conference, London, 1924. Report of Proceedings. Cambridge: Univ. Press, 1925, pp. 31–103, figs. 7*).—A symposium on the economic possibilities of plant breeding, held at the Imperial Botanical Conference at London, July 7–16, 1924, and led by W. Bateson, included papers on The Economic Possibilities of Plant Breeding, by F. L. Engledow; The Inheritance of Cropping in the Potato, by R. N. Salaman; an account of cotton breeding in Egypt, by M. A. Bailey; a description of breeding work at the Scottish Plant Breeding Station, by J. M. F. Drummond; and Sugar-cane Breeding in India, by T. S. Venkatraman.

A second symposium dealt with the value of selection work in the improvement of crop plants. Papers were presented on The Methods and Value of Selection, by J. Percival; Selection Work on Herbage Plants, by R. G. Stapledon; Defects in the Theory and Practice of Selection, by W. L. Balls; The Value of Selection Work in the Improvement of the Flax Crop, by G. O.

Searle; and Selection of High Yielding Varieties of Rice in Malaya, by W. N. Sands.

On the cranial structure of the cattle of Auvergne and their place in the Rütimeyer-Wilckens classification of cattle races [trans. title], L. ADAMETZ (*Ztschr. Tierzüchtung u. Züchtungsbiol., 2 (1924), No. 2, pp. 163–177, figs. 2*).—The author reports the results of a study of the proportions of the crania of 11 Auvergne cattle and discusses their relation to other races of cattle.

Investigations of the variation and inheritance of teats in swine, I [trans. title], H. NACHTSHEIM (*Ztschr. Tierzüchtung u. Züchtungsbiol., 2 (1924), No. 2, pp. 113–161, figs. 22*).—The author has studied the numbers of mammae in 1,000 offspring of 8 boars mated with various sows, the numbers of mammae of which were known. The boars and sows were of various breeds, mostly European, and included a wild boar. The individual offspring varied in the numbers of mammae which they possessed from 10 to 17 and averaged 12.97. The modal number was 14. Much variability was, however, evident, especially among the offspring of the different boars, in which the mode varied from 10 for the wild boar to 14 for 4 of the domestic boars.

The numbers of mammae in the offspring of each mating are tabulated in detail and charted and discussed for the offspring of each boar. The author believes that 7 pairs is the normal number, of which the first, third, fourth, fifth, and seventh are relatively constant, while the second and sixth pairs show greater variability in their appearance or absence. Either or both teats of these pairs may be present, absent, or rudimentary. Additional teats may occur either singly or in pairs between the normal teats, but they are usually not so well developed as the normals. An additional pair may occur posterior to the others in the region of the scrotum of the male. These usually occur symmetrically, but remain rudimentary. The male offspring were found to have practically the same number of teats as the females, and the males were considered as important in the determination of the numbers of mammae in the offspring as were the females.

Swine races originating in various sections of the world are discussed as to the numbers and pairs of mammae naturally possessed by each.

Teat number and pig number [trans. title], H. NACHTSHEIM (*Deut. Landw. Tierzucht, 29 (1925), No. 21, pp. 345–349, figs. 3*).—Essentially the same material as noted above, with additional data bearing on the relation of the number of mammae to litter size and the rate of growth of pigs. After classifying different breeds, little relation was found between the numbers of mammae and the average litter size. The numbers of pigs in a litter were found to show successive increases with succeeding litters. The weights of individual pigs in a litter of 10 were recorded weekly up to 7 weeks of age, as well as the teats on which each pig suckled.

Information on disproportionate dwarf growth (achondroplasia) in the production of mutations under domestication [trans. title], L. ADAMETZ (*Ztschr. Tierzüchtung u. Züchtungsbiol., 3 (1925), No. 1, pp. 125–140*).—The abnormalities of the bulldog calves previously described by F. A. E. Crew in Dexter cattle[1] and a similar abnormality described by the author[2] are discussed as evidences of mutations occurring under domestication. Both abnormalities were found to be due to faulty internal secretions and resulted in the death of the affected individuals.

[1] Roy. Soc. Med. [London] Proc., Compar. Med. Sect., 17 (1924), pp. 39–58.
[2] Arb. Lehrkanz. Tierzucht Hochsch. Bodenkult. Wien, 2 (1923), pp. 4–72.

Allergic irritability.—II, Anaphylaxis in the guinea pig as affected by the inheritance, P. A. LEWIS and D. LOOMIS (*Jour. Expt. Med., 41 (1925), No. 3, pp. 327–335*).—Inbred lines of guinea pigs, previously shown by Wright and Lewis (E. S. R., 44, p. 780) to differ in their relative resistance to tuberculosis, have also proved to differ in their resistance to anaphylactic shock in the same order.

Lethal factors [trans. title], C. WRIEDT (*Ztschr. Tierzüchtung u. Züchtungsbiol., 3 (1925), No. 2, pp. 223–230, figs. 7*).—A review of the occurrence of lethal factors which have been discovered in the yellow mouse, cattle, horses, swine, and dogs.

On the meiosis and the chromosome number in different races of Solanum melongena L. [trans. title], H. KOJIMA (*Bot. Mag. [Tokyo], 39 (1925), No. 460, pp. 100, 119–123*).—Observations upon the pollen-mother cells of different varieties of eggplants showed the diploid chromosome number to be 24 and the haploid number 12. Although the varieties differ widely phenotypically, no perceptible differences were noted in the form, size, or number of the chromosomes. From the results of the study and from records upon other genera of the Solanaceae, the author suggests the basic chromosome number for this family to be 6.

The inheritance of soft and hard (stiff) hair in the faces of sheep [trans. title], C. WRIEDT (*Ztschr. Tierzüchtung u. Züchtungsbiol., 3 (1925), No. 2, pp. 231–234*).—In studies of the inheritance of soft and hard hair on the face of the offspring of seven Rygja rams (a Norwegian breed), it has been found that the soft hair behaves as a simple Mendelian dominant to hard hair.

Inheritance of a stiff wool tuft on the rump of sheep [trans. title], C. WRIEDT (*Ztschr. Tierzüchtung u. Züchtungsbiol., 3 (1925), No. 2, pp. 241, 242, fig. 1*).—A stiff tuft of wool occurring on the posterior portion of the rump of two rams was found to be inherited as a simple Mendelian dominant, both animals being heterozygous.

Hereditary notch in the ears of cattle [trans. title], C. WRIEDT (*Ztschr. Tierzüchtung u. Züchtungsbiol., 3 (1925), No. 2, pp. 235–238, fig. 1*).—The author has described the occurreuce of a hereditary notch in the tip of the ears of cattle which showed much variability. It was found to he inherited as a simple Mendelian dominant, though no animals homozygous for this condition were found.

Inheritance of cheek spots with black hairs in Norwegian Westland horses [trans. title], C. WRIEDT (*Ztschr. Tierzüchtung u. Züchtungsbiol., 3 (1925), No. 2, pp. 239, 240*).—The occurrence of spots of long black bristle-like hairs on the cheek of horses has been found to be inherited as a simple Mendelian dominant character. Matings of heterozygous individuals with normals produced 24 offspring with and 26 withont the bristles. All the offspring of one horse showed the characteristic, indicating that he was homozygous.

Correlation between the quantitative characteristics of selected elite plants of rice, wheat, and barley, and between the same characteristics of their offspring [trans. title], KONDO, MANTARÔ, and Y. NOGUTI (*Nôgaku Kwaihô (Jour. Sci. Agr. Soc. [Japan]), No. 242 (1922), pp. 947–962; abs. in Bot. Abs., 14 (1925), No. 7, p. 957*).—Quantitative characters were studied in selected plants of eight varieties of rice, three of wheat, and three of barley, and in the progeny of each plant. The authors found positive correlation to exist between the cereal and its progeny in the following characters: Number of kernels on spike or panicle, spacing of kernels on the panicle, 1,000-kernel weight, and culm length. No definite correlation was found regarding number

of culms, total plant weight, total grain weight, straw weight, grain weight: total plant weight, and glume weight: grain weight.

Linkage in rice [trans. title], N. TAKAHASI (*Idengaku-Zassi [Japan. Jour. Genetics], 3 (1923), pp. 23–30; abs. in Bot. Abs., 14 (1925), No. 7, p. 959*).—Observations on natural hybrids were concerned with common v. glutenous endosperm, and the colors of the awn or glume tip, whether red, first pale yellow then red, or white. The endosperm characters segregate as usual in a ratio of 3 common : 1 glutenous. The color characteristics of the awn or glume tips give a 9 red : 3 yellow-red : white ratio. The author considers that red=$CCRR$, white=$ccRR$, F_1=$CcRr$, and yellow-red=$CCrr$ or $Ccrr$. The deviation from the expected ratio might be explained by linkage between the factors C (for color) and U (for usual endosperm type).

The time of sex determination in plants, J. H. SCHAFFNER (*Ohio Jour. Sci., 23 (1923), No. 5, pp. 225–240, fig. 1*).—Having become convinced by cytological investigations that sex determination, sex differentiation, and sex reversal are independent of chromosome aggregations and segregations occurring at the fertilization and reduction division periods, and having previously contributed numerous data bearing on the general problem of sex determination or reversal (E. S. R., 42, p. 820; 44, p. 428; 51, p. 822), the author now presents a general view of facts considered relevant in this connection.

In all normal cases sex determination arises but once in the life cycle, even though there is an alternation of generations in which it would be possible for the sex to be determined independently for both the gametophyte and sporophyte were sex determination dependent on aggregation and segregation of chromosomes. Comparison is made of the determination of maleness and femaleness with the ordinary process of morphological determination in the ontogeny.

Practically all plants can be placed in three categories or evolutionary series in respect to their sexual states. The first stage contains plants without sex, Protophyta. The second contains sexual plants with and without alternation of generations, classed as Nematophyta, Bryophyta, and Pteridophyta. The third stage contains sexual plants with an alternation of generations, the gametophyte being unisexual and the sporophyte showing sexual dimorphism, and on all levels (except the lowest) showing phyletic series ranging from individuals with bisporangiate flowers to monecious and finally diecious individuals. This group includes Pteridophyta, Gymnospermae, and Angiospermae.

Graphical representation is made of the principal stages of the life cycle of the archegoniates and seed plants at which sex determination or sex reversal takes place in various species, the successive stages showing the actual evolutionary progression or phyletic series in relation to the sexual state. It is considered important to note that whether the gametophyte be hermaphroditic or unisexual, whether the sporophyte be homosporous or heterosporous, there is normally but one stage of sex determination in the life cycle which may, however, be followed soon after by a complete sex reversal. If the sex is determined in the gametophyte there is none in the sporophyte, and if the sex is determined in the sporophyte it remains unchanged through the following gametophyte. The author's views regarding determination and reversal are presented in systematic detail, and a list of 46 groups of plants, considered characteristically illustrative, is presented.

On the production of the higher stage of male intersexuality in Lymantria dispar [trans. title], R. GOLDSCHMIDT (*Biol. Zentbl., 45 (1925), No. 3, pp. 134–136*).—The development of the sexual organs in a supermale gipsy moth

is described. This individual received the F factor from the Tokyo race and M factors from the Berlin and Hokkaido races.

A fertile mule [trans. title], H. HENSELER (*Deut. Landw. Tierzucht, 29 (1925), No. 15, pp. 245–253, figs. 12*).—The author describes a fertile mare mule found at an Italian experiment station in Tripoli. This mule had produced two foals each when mated to stallions and jacks and was evidently with foal by a stallion at the time the account was given. The first colt produced by the mare mule was sired by a jack and had been bred several times by a stallion without success. The colts sired by stallions resembled horses, while those sired by jacks were mulelike. The fertile mule and her offspring are illustrated.

Hybrid atavism in the crossing of red and black spotted Holsteins with Brown Swiss cattle, and the retardation of its appearance by castration [trans. title], A. STAFFE (*Ztschr. Tierzüchtung u. Züchtungsbiol., 2 (1924), No. 2, pp. 179–203, figs. 11*).—The author made observations on the color of 75 F_1 animals produced from crosses of red and black spotted Holsteins with Brown Swiss cattle and 9 back-crosses with other breeds.

From a study of the behavior of the colors, the author concluded that the uniform color of the Brown Swiss, designated as E, was dominant to the Holstein spotting (e) except that white spotting along the back was due to a dominant factor. F_1 calves from a red or black Holstein crossed with a Brown Swiss were pale reddish brown or dark brown in color at birth, and they gradually changed to a shiny black during the first 4 to 6 months in males and 6 to 9 months in females. Early castration of the males was found to prevent the color change. The author speaks of this black color as an example of hybrid atavism going back to the similarly colored primigenious and brachycerous cattle. A hypothesis to explain the color relations is suggested as follows:

E is a factor for uniform color, G for gray color, B for brown color, and K is a factor in whose presence G and B react to form the atavistic black. The genetic constitution of the breeds crossed was concluded to be as follows: Brown Swiss *EE kk GG BB*, red and white Holsteins *ee KK gg BB*, and black and white Holsteins *ee KK GG BB*.

A study of inheritance in tobacco crosses involving native and imported varieties, P. A. DAVID (*Philippine Agr., 14 (1925), No. 1, pp. 3–35*).—The crossing of apparently homozygous imported varieties of tobacco with native varieties and the study of quantitative inheritance of certain characters were carried on at Los Banos. Improved Gold Leaf and Connecticut Havana, imported varieties, were used as male parents on the native strains Repollo, San Antonio, San Juan Batec, Romero, and Dammao Broad Leaf.

Segregation of F_2 plants as to age of flowering is evident, although it did not follow uniformly a definite ratio. Distinct F_2 segregation was observed as regards plant height, the F_2 in certain crosses segregating into tall and dwarf plants according to monohybrid ratios of 3:1 and others following 63:1 and 15:1 ratios, respectively, when the F_2 plants were classed on a basis of the means of the parents. Based upon the modal heights of the parents, segregation into tall and dwarf plants generally followed the 3:1 ratio. The number of leaves per plant was found entirely independent of the plant height and environment. The F_2 segregation ratio in each cross as to the number of leaves per plant differed from the ratio for height in the same cross. Arrangement of leaves on the stem of the tobacco plant also followed different ratios. From one to three factors may be actually involved in the inheritance of the number of leaves per plant.

Occurrence of bunt in rye, E. F. GAINES and F. J. STEVENSON (*Phytopathology, 13 (1923), No. 5, pp. 210–215, figs. 2*).—In the course of hybridization work previously reported (E. S. R., 48, p. 334), one plant of common rye, one F_3 plant of a rye-wheat hybrid, and two F_2 plants of a wheat-rye hybrid were found affected with smut (*Tilletia tritici*), and the authors made further tests, which are detailed, of the suggestions derived from the occurrence of smut in rye and in its hybrids with wheat. The possibility and the significance of using bunt as an index of genetic relationships between wheat and rye in the hybrids are pointed out. It is considered apparent that something more than a stimulation has gone into the egg in the process of fertilization.

The inheritance of acquired characters, J. A. DETLEFSEN (*Physiol. Rev., 5 (1925), No. 2, pp. 244–278*).—This is an impartial summary of the evidence for and against the inheritance of acquired characters, pointing out the definite weaknesses in all theories so far suggested.

FIELD CROPS

The physiology of crop yield: A survey of modern methods of attack, F. F. BLACKMAN ET AL. (*In Imperial Botanical Conference, London, 1924. Report of Proceedings. Cambridge: Univ. Press, 1925, pp. 1–17*).—The symposium on the physiology of crop yield held at the Imperial Botanical Conference at London, July 7–16, 1924, included the following papers:

Experiments on Plant Growth with Controlled Light and Temperature, by F. G. Gregory; The Electrical Conditions of Plant Growth (E. S. R., 51, pp. 231, 232), by V. H. Blackman; Developmental Analysis of Crop Yield, by W. L. Balls; Plant Yield and Intensity of External Factors; Mitscherlich's "Wirkungsgesetz," by G. E. Briggs; The Technique of Plot Experiments, by E. J. Maskell; The Analysis of Weather-Crop Data, by R. A. Fisher; Analysis of Cereal Yield, by F. L. Engledow; and Rainfall and Crop Yield in the Tropics, by H. M. Leake.

Root behavior and crop yield under irrigation, F. C. JEAN and J. E. WEAVER (*Carnegie Inst. Wash. Pub. 357 (1924), pp. V+66, pls. 7, figs. 23*).—During 1922 and 1923 crops of Turkestan alfalfa, Marquis spring wheat, Kleinwanzleben sugar beets, Bliss Triumph potatoes, and Minnesota No. 13 corn were grown at Greeley, Colo., on dry land and under irrigation in soils similar as regards texture and chemical composition but varying widely in water content. The growing season was long enough and other conditions were favorable for plant growth, except the light, unevenly distributed rainfall (12.7 in. mean annual).

The roots of the crops employed responded readily to the changed environment, consisting chiefly of differences in chresard and air content. There was a striking correlation between the growth of underground and aerial plant parts. Although the root habits of a few species seem to be controlled largely by heredity and show little plasticity under changed conditions, the behavior in most species seems to depend upon the operation of such factors as water content, aeration, and nutrients.

[Field crops experiments at the Georgia Coastal Plain Station, 1924] (*Georgia Coastal Plain Sta. Bul. 5 (1925), pp. 8–19, 21–35, 40–42, 49–52, figs. 9*).—Practically the same sorts were outstanding in variety tests with wheat, oats, rye, cotton, corn, peanuts, soy beans, millets, velvet beans, field peas, vetch, bur clover, miscellaneous grasses, potatoes, and sweet potatoes as were noted previously (E. S. R., 52, p. 224), and recommendations from seeding tests with oats and wheat and fertilizer tests with oats and with peanuts are similar to those made earlier.

Wilt-resistant cotton varieties have produced the highest yields during 4 years, Petty Toole, Council Toole, Lewis 63, and Covington Toole proving good for infected lands. Decided increases have accrued from the liberal use of potassium. A fertilizer containing from 8 to 10 per cent of phosphoric acid, 2 to 3 per cent of ammonia, and 5 to 6 per cent of potash has given excellent results on the test soil, Tifton sandy loam. Rather liberal amounts of fertilizers seemed desirable, 1,000 lbs. per acre giving profitable increases. Nitrogen applied at cotton planting time should be derived from organic and inorganic sources in about equal amounts. The 1924 results indicated that from 100 to 125 lbs. of sodium nitrate or its equivalent in ammonium sulfate or other quickly available nitrogenous fertilizer applied as top-dressings or side applications to cotton will produce economical increases in yield. Liming did not appear to benefit either cotton or corn. Cotton is at present receiving the most benefit from a complete fertilizer in conjunction with a cover crop. Unthinned cotton has not produced as well as thinned cotton.

Corn has responded well to a fertilizer containing 9 to 10 per cent of phosphoric acid, 2 to 3 per cent of ammonia, and 4 to 5 per cent of potash. During the dry growing season of 1924 corn receiving at planting fertilizer with sodium nitrate as the nitrogen source yielded best, while in 1923 when moisture was abundant the best yields were obtained from a complete fertilizer used as a top-dressing when the corn was about 15 in. high. Appreciable increases have followed the use of a cover crop in conjunction with a complete fertilizer.

Early plantings (April and May) and late harvests (September 15 to November 1) continued to result in the highest yields of sweet potatoes. Although the closer spacings have given a higher total yield, plantings made 8, 12, and 16 in. in the drill differed very little in production of No. 1 roots. Fertilizer trials seemed to indicate that the sweet potato feeds heavily on nitrogen. The fertilizer formulas giving the highest yields during 3 years were 8–6–2 (P–N–K), 8–4–4, and 8–2–6. Thus far 800 lbs. of fertilizer per acre appears most profitable. Northern-grown stock has yielded slightly better than southern-grown during 3 years. A high percentage of potassium did not seem essential to the keeping quality of the sweet potato in storage. Southern Queen, Triumph, Nancy Hall, York Yam, and Shoer Early in order showed the least rot of 16 varieties in a storage test.

April 1 plantings produced higher average potato yields than earlier or later plantings probably because of heavier rainfall during the maturation period. While fertilizer trials with potatoes were not conclusive, an 8–4–4 formula leads in a 3-year average, and apparently from 1,000 to 1,200 lbs. per acre may be profitably applied. A slight advantage was observed in favor of overhead irrigation, although the subirrigated area required considerably more water.

While the use of at least 1,000 lbs. of 8–3–5 fertilizer has been recommended for tobacco, better color resulted where 1,000 lbs. of fertilizer containing 10 per cent of phosphoric acid was used than from a similar amount carrying less phosphoric acid. Even on land not previously cropped to tobacco, tobacco on plats receiving less than 3 per cent of potash showed signs of potash starvation. Stable (horse) manure as a supplement to commercial fertilizer continues to give excellent results.

[Agronomic experiments in Hawaii, 1924], H. L. Chung, J. C. Ripperton, and H. F. Willey (*Hawaii Sta. Rpt. 1924, pp. 11, 12, 14, 15, 16, 18, figs. 3*).—These pages describe the continuation of previous work (E. S. R., 51, p. 740), including varietal trials with corn, sorghum, sweet potatoes, and

peanuts, comparisons of green manure crops, and comment on the status of the edible canna starch industry.

A study of the structure of the plant of edible canna showed important differences, both as to the character of the starch granules and the physical texture, between the cortex and the fundamental tissues. Fresh edible canna tubers can not be stored indefinitely because of the rapid darkening of the tissues upon exposure to air. This discoloration is not removed during the extraction process and lowers the quality of the starch produced. In a method developed by the station for the preparation and shipment of the dried product, darkening of the tissues does not occur, even after the material has been stored for several days.

[Field crops work on the Huntley, Mont., Reclamation Project Experiment Farm in 1922], D. Hansen (*U. S. Dept. Agr., Dept. Circ. 330 (1924), pp. 1–18, figs. 4*).—The usual descriptions of meteorological and agricultural conditions on the project are given, together with a report of the progress of experiments with field crops (E. S. R., 49, p. 824; 52, p. 434), including crop rotations; variety, manuring, and spacing tests with corn; and a fertilizer trial with sugar beets, all under irrigation. Investigations in dry-land agriculture, reported by A. Seamans, embraced crop rotations and cultural methods with winter and spring wheat, oats, barley, flax, corn, alfalfa, and brome grass.

Plant breeding and seed growing in Union of Soviet Socialist Republics during the last decade, 1914–1923 [trans. title], edited by V. V. Talanov (*Selektsiia i Semenovodstvo v S. S. S. R. Obzor Rezul'tatov Deiatel'nosti Selektsionnykh i Semenovodstvennykh Organizatsii k 1923 godu. Moscow: Novaia Derevnia, 1924, pp. VII+442, pls. 90, fig. 1*).—A comprehensive review is presented of the activities of over 30 of the principal plant-breeding institutions in Russia during the period indicated, and information is given regarding the work of numerous other agencies in plant breeding, experiments with crops, and seed production. The many illustrations have English legends, and an extensive English résumé is appended.

Symposium—the legume problem (*Jour. Amer. Soc. Agron., 17 (1925), No. 7, pp. 373–433, figs. 5*).—The papers included in this symposium have been listed earlier (E. S. R., 51, p. 799).

White clover, W. M. Ware (*[Gt. Brit.] Min. Agr. and Fisheries, Misc. Pub. 46 (1925), pp. 26, pls. 2*).—The history and agricultural value of white clover are related, the cultivation of the crop for seed is outlined, the characteristics of the seed are indicated, and properties of certain strains are described from studies at the South Eastern Agricultural College at Wye, Kent.

Ratoon cotton in Egypt, J. Templeton (*Egypt Min. Agr., Tech. and Sci. Serv. Bul. 55 (1925), pp. [3]+14, pl. 1*).—The various reasons suggested for the change from cultivation of cotton as a perennial to the annual method current in Egypt are elaborated. The results of preliminary studies with ratoon cotton appear to indicate that ratooned plants (Sakellaridis) in their second year yield more than in their first. The quality of the second year lint does not seem inferior to that produced in the first year. The crop matures much earlier in the second year than in the first and suffers less loss from bollworm attack, and in proportion to flowers produced the shedding of bolls is less.

A statistical note on the cotton variety tests at Sakha, 1916–1920, T. Trought (*Egypt Min. Agr., Tech. and Sci. Serv. Bul. 51 (1925), pp. [2]+16, pls. 2, fig. 1*).—The application of statistical methods to the results of varietal comparisons with Egyptian cotton is discussed.

Study of cotton neps, G. Butterworth (*Textile World, 67 (1925), No. 24, pp. 49, 51, figs. 5*).—Microscopic studies in the Bureau of Agricultural Eco-

nomics, U. S. D. A., showed the neps in lint cotton to consist of masses of underdeveloped fibers, generally of average length but thin, unusually flat and translucent, and often still attached to the rudimentary seed coats. Where the abortion occurred very early in the boll development, the fibers were attached to the entire testa: where abortion probably took place somewhat later in the boll development, the fibers were attached to fragments of immature testa. Microphotographs illustrate the similarity of the fibers and general appearance of neps as found in the bolls, in baled cotton, and on yarn.

Fiber plants in Argentina [trans. title], H. SECKT (*Faserforschung, 4 (1924), No. 4, pp. 171–199*).—The status of fiber production in Argentina is reviewed briefly, and the fiber crops are listed according to families, with comment on their distribution and use.

A remarkable example of pseudo winter hemp selection by natural conditions [trans. title], N. I. PUSHKAREV (*Izv. Opytn. Dona i Sev. Kavkaza (Jour. Agr. Research Don and North Caucasus), No. 6 (1924), pp. 231–250, 344, 345, figs. 6*).—Pseudo winter hemp, naturally selected from fall sown spring hemp plants surviving the winter at Rostov, is described as intermediate between *Cannabis sativa* and *C. ruderalis* in a number of characters. Its newly gathered seed have a rather high germination, and, when sown in either fall or spring, the pseudo winter hemp gave yields of stalks and seeds considerably higher than those of ordinary spring hemp.

Potato tubers and sprouts: Their value in identifying varieties, T. P. MCINTOSH (*Jour. Min. Agr. [Gt. Brit.], 32 (1925), No. 3, pp. 250–261, fig. 1*).—Shape, color, and condition of skin, position and depth of eyes, color and consistency of the flesh, type of second growth, and microscopic characters are discussed as the characters of the tuber which persist after maturity and are useful in diagnosis. The tubers of some potato varieties common in Great Britain are classified as to shape and as to color of tuber and flesh.

Potato varieties [trans. title], K. SNELL (*Arb. Forschungsinst. Kartoffelbau, No. 5, 3. ed., rev. and enl. (1925), pp. 138, pls. 2, figs. 15*).—This revision of the potato classification noted earlier (E. S. R., 46, p. 231) gives the principal characteristics of 248 German, 33 Dutch, and 24 Scotch varieties, and of 12 groups of American varieties.

Selection and improvement of sugar-beet seeds in the Union of Soviet Socialist Republics (*New York: Amtorg Trading Corp., [1925], pp. 16, figs. 4*).—This pamphlet explains the status of sugar-beet breeding, describes the soil and climatic conditions at the 14 plant-breeding stations of the sugar trust, outlines the method used in improving sugar beets, and tabulates the results of comparative trials with Russian, German, and Polish seed.

Sugarcane breeding in India—hybridization to testing, T. S. VENKATRAMAN (*Agr. Jour. India, 20 (1925), No. 3, pp. 173–186, pl. 1, figs. 2; abridged in Planter and Sugar Manfr., 75 (1925), No. 12, pp. 228–231*).—Certain details of the technique adopted at the Coimbatore (Madras) Sugar Cane Breeding Station concern the study of parents, selfing, hybridization, collection and storage of tassels, germination and early growth stages, nurseries, and plat testing.

Some Java P. O. J. seedlings in Tucumán and Porto Rico, A. H. ROSENFELD (*Jour. Dept. Agr. Porto Rico, 8 (1924), No. 3, pp. 5–87, pl. 1, figs. 16*).—A résumé of experimental and analytical data reveals that the behavior in Porto Rico of P. O. J. canes 36, 105, 213, and 234 is surprisingly similar to that displayed in Tucumán. P. O. J. 36 and 213, outstanding in cane and sucrose production, may possibly replace less profitable varieties now grown extensively in Porto Rico. Appended are a discussion of the fiber content of the P. O. J. canes and its significance, a technical description of the P. O. J.

canes indicated, and an annotated bibliography of the P. O. J. canes embracing 215 titles.

Fertilizer experiments with tobacco, N. T. NELSON, P. J. ANDERSON, ET AL. (*Connecticut State Sta., Tobacco Substa. Bul. 5 (1925), pp. 3–34*).—Fertilizer experiments with tobacco during the period 1922–1924 included comparisons of different nitrogen carriers, amounts of phosphoric acid, kinds of potash, and kinds of manure, and methods of applying fertilizers. The tests were made with modifications of a basal ration comprising cottonseed meal 2,100 lbs., per acre, castor pomace 800, sodium nitrate 200, precipitated bone 300, acid phosphate 200, and potassium sulfate 400 lbs., and supplying 264.2 lbs. of ammonia, 224.9 of phosphoric acid, and 239.5 lbs. of potash.

The inferior quality during 2 of 3 years where mineral sources of nitrogen alone were applied indicated that the complete substitution of mineral for organic sources of nitrogen should be avoided and the quality of the tobacco maintained even though the immediate net return is no larger. The results indicated that mineral carriers of nitrogen may advantageously supply one-half of the nitrogen. Supplying half of the nitrogen in dry ground fish compared very favorably with the basal ration and was superior during 2 of 3 years. Tankage did not give as favorable results as did the substitution of fish.

Increasing the phosphoric acid to 306 lbs. per acre was followed by decided depression in the yield and quality of tobacco. The highest average yield for the period was obtained where 225 lbs. of phosphoric acid were supplied by adding both acid phosphate and precipitated bone to the organic carriers, but the best quality was obtained where the acid phosphate was omitted but the phosphoric acid brought up to 191 lbs. by adding precipitated bone. The only noticeable effect of omitting all mineral phosphoric acid carriers was a slight reduction in quality.

During 1923 and 1924 there has been no marked difference in the quality or quantity of the tobacco grown on plats receiving the potassium all in potassium sulfate, all in potassium-magnesium sulfate, or one-half in each of these salts. Potassium-magnesium sulfate could probably be used to prevent magnesia hunger without serious impairment of the quality or yield of the tobacco. This property of the salt seems without advantage where reasonably large amounts of organic fertilizer are used, and furthermore, the salt adds to the bulk of fertilizer and doubles the quantity of sulfuric acid introduced into the soil.

When 3,000 lbs. of fertilizer per acre were used no advantage appeared either in quality or yield of the tobacco when this amount was applied in a number of applications. When the quantity of fertilizer was reduced the subsequent reduction in yield and quality more than offset the saving in fertilizer cost.

Tobacco growing in Dupnica, Bulgaria [trans. title], N. VICHEV (*Spis. Zeml. Izp. Inst. B"lgariia (Rev. Insts. Recherches Agron. Bulgarie), 3 (1925), No. 2–3, pp. 177–232, pl. 1, figs. 18*).—The agricultural characteristics of the tobacco growing areas of the region are set forth, with production statistics, descriptions of varieties, cultural and field methods, harvesting and curing practices, insects and diseases, and a French résumé.

On the nicotine and ash constituents of the leaf of the tobacco plants grown on the fertilizer plots at the Rustenburg Tobacco and Cotton Experiment Station, season 1921–22, J. V. CUTLER (*So. African Jour. Sci., 21 (1924), pp. 208–222, figs. 3*).—Tobacco leaf from a fertilizer experiment at the Rustenburg Tobacco and Cotton Experiment Station (E. S. R., 50, p. 236) was examined to ascertain the effect of various fertilizers upon the growth of the plant, the leaf, the ash, the ash constituents and the nicotine, and the form of nicotine.

The lighter lime applications were followed by increases in acre yield, the area of the leaf, and the percentage of midrib. With potash there was an increase over the unlimed plats, whereas the reverse occurred with potash on limed plats. Nitrogen alone or with potash or with phosphorus produced an increase, however, at the expense of the lighter grades. It decreased the percentage of midrib and did not materially increase the leaf area over that of the checks. Phosphorus gave an increase over all single fertilizers and increased the percentage of the lighter grades, the area of the leaf, and the percentage of the midrib. Phosphorus and potash produced lower yields than were obtained with nitrogen and phosphorus and a higher percentage of lighter grades. Complete fertilizer and kraal manure produced the highest acre yields. Nitrogen had the effect of producing a more luxuriant growth but with a thicker or more fleshy leaf and a consequent lowering of the quality.

The limed plats yielded leaves containing higher amounts of crude and true ash. While fertilizers were not effective in this respect, potash used with lime gave a slight increase. Liming brought about an increase in the calcium, potassium, phosphorus, and sulfate ions, contrary to results in Ohio (E. S. R., 33, p. 732), an increase in the total chlorine, and a reduction in the silicon, magnesium, sodium, iron, and aluminum. Comparison of the ash content of the yellow, red, and dark grades showed a slight increase of potash, sulfate, and iron in the lighter grades with a corresponding increase of lime and silica. The remaining ions were in substantially similar proportions.

The nicotine content of the leaf from unlimed plats was lower than that from limed plats, following the grades in nearly every case. The nicotine in the yellows was less than in the red and still less than in the dark red. The bottoms contained less nicotine than the middle grades. Application of nitrogen caused a marked increase in nicotine, not so prominent when the nitrogen was combined with other fertilizers. Plats receiving complete fertilizers outyielded manured plats. Examination of the leaf with various solvents showed that the nicotine is apparently in combination with the calcium present. Where the calcium content was rather high the nicotine was more readily soluble in alcohol than in ether.

A contribution to our knowledge of the function of nicotine in the tobacco plant, J. J. THERON and J. V. CUTLER (*So. African Jour. Sci., 21 (1924), pp. 189–194, figs. 2*).—Experiments at Potchefstroom Experiment Farm with *Nicotiana rustica* demonstrated that the total nicotine produced per acre and the percentage of nicotine per plant increase up to the flowering stage, after which a rapid decline of nicotine in favor of other nitrogenous products is seen. The formation of seed has the immediate effect of reducing the percentage of nicotine per plant, whereas if seed formation is prevented the nicotine tends to increase rather than decrease. Even after harvest the plant continues to grow for some time, and concomitant with this there is a marked decline in the nicotine content. To effect an increase, both in the acre yield of nicotine and the percentage of nicotine per plant, the crop must be treated with complete fertilizers. From the foregoing, nicotine seems to function preeminently as a storage product and probably only incidentally as a protective agent.

Agricultural classification of the principal varieties of wheat cultivated in France and in French North Africa [trans. title], J. DE VILMORIN (*Rev. Gén. Agron., n. ser., 15 (1925), No. 2, pp. 63–89*).—The principal varieties of wheat grown in France and North Africa are classified according to the synonymic classification of H. de Vilmorin, indicating botanical varieties included by Percival (E. S. R., 46, p. 837) and Vavilov (E. S. R., 53, p. 138).

Hard grain texture as a basis of selection for improving the quality of Early Baart wheat, W. E. Bryan and E. H. Pressley (*Jour. Amer. Soc. Agron., 17 (1925), No. 7, pp. 440–443*).—Hard strains originating in a pedigreed strain of Early Baart wheat at the Arizona Experiment Station were about 6 per cent higher in absorption than the soft parent and about 2 per cent higher in gluten. While the higher absorption of the hard strains gives a greater bread yield, nothing seems to have been gained in loaf volume. At least in the case of these hard strains, selection based on increased hardness of grain in a warm, irrigated region does not materially enhance the quality of the gluten, even though the gluten percentage is actually increased.

The miller's almanack and year book for 1925 (*Minneapolis: Northwest. Miller, 1925, 17. ed., pp. 391, figs. 40*).—A compilation of statistical and general information concerning the milling industry and the grain trade.

Lawns and lawn making, H. F. Major (*Missouri Sta. Circ. 136 (1925), pp. 12, figs. 4*).—Instructions are given for making new lawns, for maintaining old lawns, and on seeding practices and mixtures. A system of fertilizing lawns over a period of years is outlined briefly.

Official Seed Testing Station for England and Wales—seventh annual report, [1924], A. Eastham (*Jour. Natl. Inst. Agr. Bot., No. 3 (1925), pp. 20–31, fig. 1*).—The average germination and purity are tabulated for 18,886 samples of agricultural seeds received during the year ended July 31, 1924. Examinations in the principles and practice of seed testing are appended.

The official seed-testing station, N. R. Foy (*New Zeal. Jour. Agr., 30 (1925), No. 5, pp. 321–326*).—The average germination and purity and incidence of the principal weed seeds are recorded for 8,266 samples of agricultural seed submitted to the New Zealand Seed-testing Station at Wellington during 1924.

HORTICULTURE

[Horticultural investigations at the Georgia Coastal Plain Station] (*Georgia Coastal Plain Sta. Bul. 5 (1925), pp. 36–40, 42–48, figs. 5*).—Herein are presented, as usual (E. S. R., 52, p. 232), brief reports upon the results of miscellaneous varietal and cultural tests. New Stone tomatoes planted April 1 were much more productive than those sown later. A comparison of overhead and subirrigation for the tomato showed the former to be superior, not only in yield returns but also in a lower water requirement. Of eight watermelon varieties, the Thurmond Grey was conspicuously the best yielder, and, as in the case of the tomato, early planting was advantageous to this crop. Thinning to two melons per vine increased the size of the individual fruits. Beans planted in the spring were much more productive and more healthy than the same varieties planted in the autumn. Of early-maturing wrinkled peas, the Thomas Laxton was the outstanding variety. Notes on fruit tests are included.

[Horticultural investigations at the Hawaii Station, 1924], W. T. Pope (*Hawaii Sta. Rpt. 1924, pp. 4–10, 17, 18, figs. 4*).—A general progress report (E. S. R., 51, p. 745).

That elevation above sea has a marked influence on the time of ripening in the avocado was noted in the Nimlioh and Macdonald varieties, both of which ripened their fruits much later at higher elevations. The best success in propagating avocados was attained with stocks and scions in a vigorous, forced condition of growth.

The satisfactory performance of the Isabella grape led to the introduction of other varieties from the mainland. Work with the papaya was continued in an attempt to establish varieties with well-fixed characters. Papaya fruits

produced at 1,000 ft. elevation were usually insipid and misshapen, probably because of the cooler temperature and the greater rainfall. Parthenocarpic papaya fruits were found to be seedless and poorly flavored. Mangoes fruited satisfactorily during the year, one new seedling bearing large, good-quality fruits. The Macadamia nut, a popular introduction, was found to thrive best at elevations of from 1,000 to 2,000 ft. Among new introductions during the year were eight varieties of breadfruit from Samoa.

A report by J. C. Ripperton upon comparative analyses of vegetables grown on the islands and similar varieties produced on the mainland indicated that Hawaiian vegetables are fully as high in minerals and nutrients as those grown in the United States proper.

H. F. Willey reports that at the Haleakala Substation, where the elevation is 2,100 ft., *Eucalyptus robusta* showed promise as a windbreak, and the Smooth Cayenne pineapple thrived despite the unusual altitude.

Experimental studies of the effects of cultivation on certain vegetable crops, H. C. Thompson (*Amer. Soc. Hort. Sci. Proc., 21 (1924), pp. 108–115*).—An average of five years' records, taken at Cornell University, upon beets, carrots, onions, cabbage, celery, and tomatoes submitted to three different cultural treatments, namely, (1) cultivated once a week, (2) no cultivation, weeds cut with a sharp hoe, and (3) weeds allowed to grow, showed no distinct superiority in favor of cultivation except in the case of onions and celery. In fact with the cabbage, in three of the five years, scraping the weeds resulted in larger yields than did tillage.

Determinations of soil moisture in the various plats showed that cultivation generally increased moisture. However, this was not always the case, since in 1922 the hoe-scraped plats of beets and carrots averaged higher in moisture than did the corresponding tilled areas. That a fairly positive correlation prevailed between soil moisture conservation and yields was evidenced in an agreement of high moisture and high yields in 18 out of 28 sets of yield data. Records taken at 3- and 5-in. depths showed the soil of the scraped plats to be consistently warmer than that of the cultivated areas, with the differences more marked at the lesser depth.

Observations upon the root systems of the several species showed marked differences, and indicated that species like cabbage, with a sturdy, spreading root system, were best able to thrive without cultivation.

Blanching celery, R. B. Harvey (*Minnesota Sta. Bul. 222 (1925), pp. 3–20, figs. 10*).—That ethylene in proper concentrations, varying from 1 part in 10,000 to 1 part in 1,000 of air, is an effective agent in hastening the blanching of celery was indicated in investigations herein reported. The so-called self-blanching varieties required 6 days and the dark green types from 10 to 12 days to attain a satisfactory appearance. Overdoses of ethylene gas caused a browning of the leaves. It is suggested that ethylene gas is readily procurable, being used quite universally in hospitals for anesthesia, and at the concentration recommended for celery blanching, the cost of application is moderate.

It was found that acetylene in similar concentrations was also capable of successfully blanching celery, but on account of its unpleasant odor and its tendency to cause headaches it is not equally recommended. The action of the two gases in blanching celery is deemed to lie in their ability to hasten the normal process of decomposing chlorophyll pigment rather than in any direct chemical action. The quality, texture, color, and keeping quality of celery blanched with ethylene gas were found to be equal to those of celery blanched by the older methods.

The development of the roots of young trees [trans. title], V. KOLESNIKOV (*Nauch. Agron. Zhur.* (*Jour. Landw. Wiss.*), *1* (*1924*), *No. 3*, *pp. 211–229*, *figs. 2*).—Long-continued studies at the Petrovsk Agricultural Academy, near Moscow, upon the root development of various trees, including the apple, crab apple, pear, cherry, and Scotch pine, showed that in young trees each species has a regular and uniform manner of growth. In the course of growing period roots appeared in definite series, and the longer root systems generally possessed the greater number of series. There was found a gradual increase in the number of roots per series as growth proceeded. The deeper roots were usually found to be the longer. A relation was noted between the amount of roots in a given plant aud their length, and for certain plants a definite coefficient was computed for this correlation.

Summer pruning the central leader, W. A. RUTH and V. W. KELLEY (*Amer. Soc. Hort. Sci. Proc.*, *21* (*1924*), *pp. 370–372*).—Observations upon young Winesap, Grimes, and Jonathan apple trees from which about 1 in. of the central leader was removed during the growing season showed very little stimulation of growth in the buds below the cut. In all cases the last bud continued the upward growth, and in most instances one and rarely two laterals appeared. With one exception, the second bud back of the cut produced the strongest lateral, suggesting to the authors the possibility of correctly placing scaffold limbs by carefully selecting this bud beforehand. In no case did the lateral branch compete with the new leader, either in rapidity of growth or direction, the angle between the two being always wide.

In dormant pruned Delicious and Golden Delicious trees, heading resulted in two or more competing leaders. It is suggested that, by repeating the summer tipping during the season, it is possible to select four framework branches in a single season on a 2-year-old tree.

Annual and biennial bearing in York apples, H. D. HOOKER (*Missouri Sta. Research Bul. 75* (*1925*), *pp. 3–16*).—Assisted by a freeze, which greatly reduced blooming in the normally full crop year, the author succeeded in inducing annual bearing in a large proportion of treated trees by applying nitrate of soda in the middle of September for four consecutive years. Records of the percentage of blossoming spurs on two representative trees, one in the fall nitrated and one in the check plat, showed that, although both trees were markedly biennial previous to treatment, the fall nitrated tree thereafter formed more fruit buds in the normally full crop year than did the check tree, resulting in annual fruiting.

Observations on the performance of individual spurs showed that, although fall nitrated trees blossomed to a greater extent in the upper portion of the tree in the off years, there were differences in general bearing habit which indicated annual bearing did not depend solely on biennial bearing in separate parts of the tree. Dividing spurs into four classes according to their performance, it was found that in alternate-bearing trees a great majority of spurs fell, in the fruitful year, into that class which blossomed but formed no fruit buds and, in the unfruitful year, into that class which failed to blossom but formed fruit buds. On the other hand, in the annual bearers about one-third of the spurs blossomed and bore fruit buds in the same year.

In respect to spur length, biennial bearers in the off year produced fruit buds on practically all spurs irrespective of length. The highest percentage of fruit bud formation in the on year occurred in spurs 4 and 5 mm. in length. On fall nitrated trees there was found a definite growth performance relationship, namely, the longer spurs exhibited the highest percentage of fruit bud formation.

An analysis of measurements taken on the same spurs from year to year yielded a correlation of +0.45±0.028 in the treated trees and −0.022±0.053 in check trees. Thus, while no relationship was shown in the check trees, there was a positive relation between growth of individual spurs in successive years in the annual-bearing trees. The author believes that the spurs of the trees are part affected by conditions within the spur itself, thus exhibiting a degree of autonomy which is not manifested in the controls. It is believed that spur growth in biennial trees is limited in the on year by carbohydrate diversion to the fruits and in the off year by a shortage of nitrogen consequent to overproduction the preceding season.

The ability of fall nitrated trees to produce annual crops was enhanced by a high percentage of set in the blossoms produced in the normally off year. That spring applications of nitrate of soda in the bearing season may also benefit the set was shown in a considerably increased set from flowers of biennial trees treated with nitrate of soda in the early spring.

In respect to the effect of annual production on the total yield, records showed that the combined production of annual-fruiting trees during the two years was greater than that of biennial trees, even with spring applications of nitrate.

The Rome Beauty apple as an annual cropper, F. H. BALLOU (*Ohio Sta. Bimo. Bul., 10 (1925), No. 8, pp. 142–145, fig. 1*).—In describing the natural growth and fruiting habits of the Rome apple, the author asserts that annual bearing in this variety is largely due to its habit of producing many slender, terminal fruit-bearing twigs, which apparently bear in alternate years. The removal of all the nonbearing twigs from a large Rome Beauty tree in 1924 resulted in an absence of fruit in 1925, whereas contiguous, similar trees were carrying a generous crop.

The "gas" content and ventilation of refrigerated holds carrying apples (*[Gt. Brit.] Dept. Sci. and Indus. Research, Food Invest. Bd., Spec. Rpt. 21 (1925), pp. IV+36, pls. 14, fig. 1*).—Comprehensive studies of the atmospheric conditions existing in ventilated and unventilated holds of ships carrying fruits from Australia to Great Britain showed no tendency for CO_2 to accumulate in low points. In fact the composition of the atmosphere was approximately uniform throughout the hold and even within the boxes of fruit. Daily measurements of CO_2 and O_2 concentrations in two unventilated holds showed an initial rapid rise in CO_2 to 10 per cent, followed by a fairly constant concentration, with a rise at the end of the voyage to a maximum of 12.8 per cent. On the other hand, O_2 concentrations were inverse of the CO_2, so that the sum of CO_2 and O_2 percentages remained quite constant, 21+ per cent throughout the entire voyage.

Determinations of the rate of CO_2 production in Cleopatra, Jonathan, and Scarlet Pearmain apples at hold temperatures showed an approximate output of 2.8 cu. ft. per day per ton of fruit, leading to the conclusion that there must be a very considerable leakage of CO_2 from the holds to account for the relatively low concentrations recorded. The rate of loss of CO_2 expressed in cubic feet per day divided by the CO_2 concentration is termed the leak coefficient, and is adopted as a relative measure of the leakiness in a given hold.

It was found that CO_2 concentration was directly correlated with weather conditions. For example, rough seas, high winds, and unsettled weather increased leakage, the maximum rate of leakage in rough weather being approximately twice the minimum for calm weather. High fruit temperatures at the time of loading and slow rate of cooling favored the accumulation of large amounts of CO_2 during the first part of the voyage. On the contrary,

precooling had no permanent effect in keeping down the CO_2 concentration. Marked reductions in CO_2 concentration were obtained in holds ventilated by means of fans.

Appended are tabulated data, a discussion of the value of CO_2+O_2 and its significance, suggestions for the ventilation of holds of the grid type, and comments on apple boxes and stowage on board ship.

New fruits [from the South Dakota Station], N. E. HANSEN (*South Dakota Sta. Rpt. 1924, pp. 27, 28*).—Brief mention is made concerning the origin and the characteristics of the Chinook apple (Baldwin × wild crab), Saponsky pear, and Sunset gooseberry.

Notes on pruning and training Concord grapes in Illinois, A. S. COLBY and A. C. VOGELE (*Amer. Soc. Hort. Sci. Proc., 21 (1924), pp. 384–387*).—Studies conducted at the University of Illinois with 610 Concord grapevines trained according to several standard systems, namely, single and double trunk Kniffin, Munson, fan, and Chautauqua, showed the maximum yield on vines trained to the Chautauqua system. However, from the standpoint of convenience, economy, and ease of renewal, the Kniffin system is deemed the best. Pruned to from 46 to 55 buds, Kniffin-trained vines gave satisfactory yields of attractive, large-berried clusters. Above 55 buds the yields were larger, but the clusters and berries smaller. Apparently, in unproductive vines the number of buds per vine was of less importance.

The most productive canes were those whose internodes were from 10 to 15 times as long as the diameter. Canes less than 0.6 cm. (0.23 in.) in diameter were invariably unproductive and weakly vegetative, and frequently had short internodes. Canes ranging from 0.6 to 0.85 cm. in diameter were most productive. From 0.85 to 1 cm. the canes were less fruitful, and above 1 cm. were invariably unproductive. The small buds close to the base of each cane were dormant or produced fruitless canes. In 950 such canes only a few clusters of fruit were produced.

[Horticultural investigations conducted by the Philippine Bureau of Agriculture] (*Philippine Bur. Agr. Ann. Rpt. 23 (1923), pp. 119–143, pls. 5*).—Observations at Tanauan upon the growth of the Batangas mandarin oranges budded on Calamondin and rough lemon stocks and upon their own roots showed only a slight superiority of the foreign stocks over own roots. Thinning out and cultivating a rundown mandarin orchard resulted in greater fruitfulness and vigor. Observations after 11 weeks upon mandarin oranges immersed in solutions of formalin, copper sulfate, and potassium permanganate previons to storing indicated that the potassium permanganate had slightly reduced losses, the percentages of decay being 79.5, 82.3, and 73.9, respectively. The loss in the control lot was 80 per cent. Attempts to promote fruitfulness in the mandarin orange by various means indicated that smudging with sulfur fumes is an effective treatment. Ringing and debarking of the branches either wholly or partially, had no effect on fruiting and injured the growth. Root pruning was of no benefit.

At Lamao, attempts to propagate the mango by cuttings and marcotting were unsuccessful. Grafting resulted in 84.6 and budding in 21.4 per cent of success. With and without moss, the percentages of living grafts were 58 and 25, respectively. Smudging was effective in inducing flowering of mature mango growths. Full top-working of mango trees was more successful than partial treatment. In air-tight containers, husked mango seed kept best in moist charcoal. In open vessels moss gave the best results. One cm. (0.4 in.) proved to be the best depth for sowing.

Coffee seeds retained their viability twice as long in moist media as in dry containers. Tests of acetic acid solution, salt, air-slacked lime, sugar

solution, and boiling as preservatives for ripe tomatoes showed immersion in a 1 per cent solution of acetic acid to be the most effective treatment. Finding that papaya seeds are killed by exposure to direct sunlight and also that their germination was greatly retarded by shading, it is concluded that a limited amount of sunlight is essential to their growth. Papayas were successfully propagated from branch cuttings placed in sand.

Bananas from seed: Variety experiments at the Imperial College of Tropical Agriculture, J. S. Dash (In *Proceedings of the Ninth West Indian Agricultural Conference, Kingston, Jamaica, 1924. [Kingston]: Govt., 1925, pp. 53–56*).—In attempting to breed varieties of bananas resistant to Panama disease, successful sets of fruit were obtained with three female parents, namely, Gros Michel, Silk Fig, and Sucrier, when crossed with seed-bearing species. Attempts to increase and hasten germination by immersing seeds in warm water and in acid and by incision were unsuccessful. Drying, even for a short period, apparently was destructive to viability. A few seedlings were raised, among which one, Gros Michel ♀ × Congo ♂, is deemed of special promise on account of the Panama disease resistant qualities of the male parent.

Performance records of pruned and unpruned Washington Navel trees for a period of ten years, A. D. Shamel (*Calif. Citrogr., 10 (1925), No. 12, pp. 415, 442, 443, 445, figs. 5*).—Yield records taken upon 110 pruned and unpruned Washington Navel orange trees during the 10-year period 1915–1924 indicated that pruning had a distinct tendency to reduce yields. Dividing the experimental area into six subdivisions, each pruned by a single person, there was found a gain in favor of pruning in only one of the six areas, that containing trees pruned but once, in 1914. In concluding, the author suggests the advisability of restricting pruning of vigorous, thrifty trees to the removal of objectionable branches, excessive dead wood, diseased or injured growth, and undesirable limb sports.

FORESTRY

Free distribution of forest trees in Pennsylvania, J. W. Keller (*Jour. Forestry, 23 (1925), No. 11, pp. 896–904*).—Observations made in connection with the growing and distribution of trees by the State of Pennsylvania showed that approxinmately 76 per cent of the trees distributed survive. Records showed that pitch, red, Scotch, and Banks pines are more successfully transplanted than spruce, larch, or other conifers; and that white ash, wild black cherry, and black walnut are the most easily transplanted of the broadleaf species. The best survival was recorded on moist, well-drained sites, especially those exposed to the north or the west.

A proposed classification of the forest types of the Lake States, compiled by J. Kittredge, Jr., (*Jour. Forestry, 23 (1925), No. 11, pp. 890–895*).—Based on extended observations and discussion, 17 distinct forest types are proposed as follows: Northern white cedar, tamarack, black spruce, black ash—red maple—elm, silver maple—elm, cottonwood—willow, spruce—balsam—birch, white pine, red pine, jack pine—oak, aspen—paper birch, maple—hemlock, maple—basswood, oak—maple, oak—hickory, and bur oak.

Forest protection in Ohio, B. E. Leete (*Ohio Sta. Bimo. Bul., 10 (1925), No. 8, pp. 130–142, figs. 3*).—Pointing out that large areas of rough, nonagricultural lands in southern Ohio are of use primarily for forests and constitute a dangerous fire hazard on account of the brushy nature of the growth, the author discusses the causes and effects of forest fires in this region and outlines precautions and protective measures which should be instituted in order to reduce fire losses to a minimum.

The relative light requirements of some coniferous seedlings, C. G. Bates (*Jour. Forestry, 23 (1925), No. 11, pp. 869–879, figs. 2*).—Based on records taken on the seedlings of eight conifers, namely, Douglas fir, piñon and white pines, Engelmann spruce, and bristlecone, western yellow, lodgepole, and Norway pines, grown in a darkened greenhouse under artificial light comparatively rich in the longer wave lengths of the visible spectrum and varying in intensity from 53.5 to 1.2 per cent during the first 6 months and from 16.6 to 0.4 per cent during the last 5 months, there are presented the minimum light requirements for the several species. At the end of 11 months, the Douglas fir and the Norway pine seedlings were surviving in light intensities of 0.77 and 2.8 per cent, respectively, of noon sunlight on September 20, with the other species ranged between in the above order.

It is believed that the comparatively low light intensities tolerated by the various species are due in part to the favorable quality and duration of the artificial light utilized. In most of the species there were seedlings well above the standards for normal growth. The piñon and other large-seeded pines grew less vigorously in the weakest light in which each species could survive than did the small-seeded species. The height of the surviving plants was not visibly affected by light intensity, but root length and branching were very markedly reduced in weak light.

In concluding, the author suggests that the lack of light in the forest is probably not the chief limiting factor in the survival of seedlings, since intensities as low as those utilized in the investigation do not often occur naturally, even under the densest canopy. Competition between species, rooting vigor, and ability to survive with limited moisture are factors considered probably of more vital importance.

Hastening the germination of sugar pine seed, A. W. Jacobs (*Jour. Forestry, 23 (1925), No. 11, pp. 919–931*).—Normally the seed of sugar pine (*Pinus lambertiana*) is slow to germinate and low in viability, making the species undesirable for silviculture despite the high quality and scarcity of the wood. In 12 tests of seeds representing the range of the species in the Sierra Nevada Mountains, natural germination in 120 days ranged from 18 to 53 per cent. Mechanical wounding with subsequent fungus infection, excessive electrical stimulation, hot-water treatment, and too long an application of acid all failed to increase germination. The most successful treatment for inducing the early and complete germination of sugar pine seeds was found to be immersion in water for 4 days and exposure to freezing for 48 hours. Sand proved to be the best medium for germination, especially if the seed was previously subjected to stratification. The consistently beneficial action of soaking is deemed to be due to the action of bacteria in tap water exposed to air.

It was noted that the quality of sugar pine seed was apparently related to the size and weight and to the stage of maturity. Large, heavy seed, well-filled and freshly matured, germinated more rapidly and completely than did smaller, immature or overmature seeds.

Silvicultural notes on the Benguet pine, A. H. Muzzall (*Jour. Forestry, 23 (1925), No. 11, pp. 887–889*).—Found only in central and northern Luzon, P. I., at elevations of from 4,000 to 9,000 ft., where, despite an average annual rainfall of 200 in., there is a distinct dry season, this pine is deemed desirable on account of its rapid growth, its free seeding tendency, and the good quality of its timber. Under proper management, it is believed that a good stand of merchantable timber may be produced in 80 years after cutting. Where seed trees are left at proper intervals, cutting results in a uniform, dense stand, which not only protects the watershed better than the original stands, but also furnishes a continual supply of firewood from thinning operations.

Observations upon the acclimatization of various exotic species [trans. title], I. Milde (*Spis. Zeml. Izp. Inst. B''lgariíâ. (Rev. Insts. Recherches Agron. Bulgarie), 3 (1925), No. 2–3, pp. 245–250*).—Notes are given on the behavior in various parts of Bulgaria of a large number of exotic broadleaf and evergreen forest species, including many of American origin.

Rubber culture, [K. E.] Kempski (*Die Rubberkultur. Berlin: Paul Parey, 1924, pp. 50, figs. 38*).—Prepared with special reference to the production of plantation rubber in the Dutch East Indies, this pamphlet discusses world production, development of the industry in the East Indies, improved cultural and tapping practices, the number and extent of European controlled plantations, and the preparation and handling of latex.

Volume and outturn tables for sal (Shorea robusta), S. H. Howard (*Indian Forest Rec., 12 (1925), No. 1, pp. III+87, pls. 7*).—To supplement earlier data (E. S. R., 53, p. 541), there are presented four complete sets of tables based on (1) total heights, (2) locality quality classes corresponding to the sal yield table, (3) length of commercial bole, and (4) for deduction for bark from logs measured with their bark.

Selling black walnut timber, W. D. Brush (*U. S. Dept. Agr., Farmers' Bul. 1459 (1925), pp. II+21, figs. 9*).—With a view to assisting the owner in cutting and selling black walnut to the best advantage, information is presented on market specifications, on the estimation of standing timber, scaling, cutting, storing, cost of operations, and on the best methods for locating a market and disposing of the lumber.

Instructions for making timber surveys in the national forests, including standard classification of forest types (*U. S. Dept. Agr., Forest Serv., 1925, pp. V+45*).—A handbook designed to present the policies of the Forest Service in conducting timber surveys and to assist in standardizing the methods employed in the forest districts. A standard classification of forest types, revised to April, 1925, is included.

Lumber industry of the Philippine Islands, with special reference to export species, J. A. Fowler (*U. S. Dept. Com., Bur. Foreign and Dom. Com., Trade Prom. Ser. 24 (1925), pp. IV+43, pl. 1, figs. 4*).—Prepared in collaboration with the Philippine Bureau of Forestry, this pamphlet contains general information concerning the location and the administration of the forests, the character and uses of the principal woods, export species, production, consumption, exports, and imports. Grading rules are appended.

The forests of French Guiana [trans. title], R. Benoist (*Ann. Soc. Linn. Lyon, n. ser., 71 (1924), pp. 37–44*).—A general discussion concerning the location, area, and species composition of the forests of French Guiana.

DISEASES OF PLANTS

The biological basis of foreign plant quarantines, W. A. Orton and R. K. Beattie (*Phytopathology, 13 (1923), No. 7, pp. 295–306*).—A systematic presentation of cases, conditions, and problems of pest and disease importations and of other related matters leads to the conclusion that plant quarantine policies and methods must be based on the related laws of nature. The problems of discontinuous spread (over oceans or other great barriers) are necessarily different from those of continuous spread between adjacent countries. Pests of other continents are fundamentally the most dangerous. Intercontinental trade in living plants requires to be held within the narrowest limits compatible with economic needs.

A preliminary report on the occurrence and distribution of the common bacterial and fungous diseases of crop plants in Illinois, L. R. Tehon

(*Ill. Nat. Hist. Survey Bul., 15 (1924), Art. 4, pp. VIII+173-325, figs. 127*).—In this preliminary report an account is given, in systematic form, of diseases of cereals, forage crops, fruits, vegetables, and ornamentals; in all, 165 plant diseases affecting 44 crops in Illinois. Estimates of financial loss are given, with maps indicating distribution.

Plant diseases of 1922 in western Quebec, B. T. DICKSON (*Abs. in Phytopathology, 13 (1923), No. 6, p. 290*).—Among 50 diseases mentioned, the author indicated as new or of augmented importance locally during 1922 onion pink root, *Fusarium malli* (associated later with *Botrytis* sp.), celery blight (*Septoria petroselini apii*), clover powdery mildew (*Erysiphe polygoni*), sunflower stem rot and wilt (*Sclerotinia libertiana*) and rust (*Puccinia helianthi*), apple Phyllosticta leaf spot (on McIntosh) and bitter rot (*Glomerella rufomaculans*), (on Fameuse), plum bladder (*Exoascus pruni*), and peony leaf, petal, and stem spot (*Septoria paeoniae berolinensis*).

Two diseases new to Ontario, J. E. HOWITT (*Abs. in Phytopathology, 13 (1923), No. 6, p. 291*).—Onion pink root is established in the onion-growing marshes southeast of Leamington, some crops losing not less than 10 per cent. Grape white rot was found in vineyards near Winona and St. Catherines, threatening serious injury in the case of certain commercial grape varieties. The most susceptible variety was Agawam or Rogers No. 15, unsprayed rows of which showed over 80 per cent of the bunches unfit for market. Bordeaux spray as recommended for black rot readily prevents white rot, even on very susceptible varieties.

Diseases and pests of cultivated plants in the Dutch East Indies in 1923 [trans. title], C. J. J. VAN HALL (*Dept. Landb., Nijv. en Handel [Dutch East Indies], Meded. Inst. Plantenziekten, No. 64 (1924), pp. 47*).—Systematic discussion, as previously noted (E. S. R., 51, p. 542), of plant diseases and pests during 1923 deals with these according to the crops on each residency.

Annual report of the mycologist for 1922, A. SHARPLES (*Malayan Agr. Jour., 11 (1923), No. 10, pp. 267-272*).—Progress is reported as made in studies on diseases of rubber, coconut and oil palm, and other plants.

Rubber root diseases include brown root disease (probably not *Hymenochaete noxia*, but *Fomes lamaoensis*, this disease also affecting camphor), brown bast, moldy rot, top canker (*Phytophthora* sp.?), leaf cast (*P. meadii?*), helminthosporiose (*Helminthosporium* n. sp.), and various diseases due possibly to *Phytophthora* spp.

Coconut and oil palm diseases reported include oil palm bud rot (not to be confused with the epidemic form due to *Phytophthora* sp.), a stem bleeding (*Thielaviopsis ethaceticus?*), black spot (on petioles and leaf stalks, associated with *Pestalozzia palmarum*, also with *Spongospora* sp.?), and leaf spots.

Other diseases mentioned include nematode attack on *Hibiscus sabdariffa*, and a collar disease (*Thielaviopsis ethaceticus*) of the arghan plant.

Critical observations on crown gall in Chrysanthemum frutescens, W. ROBINSON and H. WALKDEN (*Brit. Assoc. Adv. Sci. Rpt., 90 (1922), p. 400*).—The work of Smith and others regarding *Bacterium tumefaciens* as the cause of crown gall is said to have been confirmed. It is concluded that *B. tumefaciens* is always present in large numbers on the external surface and sometimes on internal surfaces of galls, but no bacteria have been demonstrated within the tumor cells. All the effects are consistent with the action of increasing numbers of *B. tumefaciens*, at first from the wounded surface, later from the gall surface, from interstices of this, or from internal surfaces. Most, if not all, of the secondary galls and tumor strands can be explained by the expansion during rapid growth of meristematic tissues in the vicinity of

the inoculated wound rather than by the intrusive growth of tumor tissue. The similarities in this respect between crown gall and malignant tumors are more apparent than real.

The physiology of perithecial and pycnidial formation in Valsa leucostoma, L. H. LEONIAN (*Phytopathology, 13 (1923), No. 6, pp. 257–272*).—This fungus, *V. leucostoma*, seems to consist of two strains, in one of which the mycelium, the conidia, or the ascospores may give rise to the perfect or the imperfect stage; in the other of which no perithecia develop under any environmental conditions.

The strain of *V. leucostoma* used in the experiments here systematically detailed was obtained from an ascospore. All the variations pertaining to the control of reproduction, as herein recorded, are ascribable to environmental modifications rather than to inherent potentialities of the fungus alone. Conidia or ascospores show like physiological reactions to the various solutions used. The quantity of mycelium, pycnidia, and perithecia increased in direct proportion to food concentration increase. Absence or decrease of food supply was not necessary to reproduction.

Cultural reactions of some dry root-rot organism, T. G. MAJOR (*Abs. in Phytopathology, 13 (1923), No. 6, p. 291*).—Seven species of Fusarium grown on 17 media differing as to constitution, pH, and temperature showed corresponding variations in growth type, coloration, chlamydospore production, and macroconidial size and type. More luxuriant mycelial growth, with more intense coloration, occurs at 25° than at 20° C., but spore size is practically unaffected. Growth character gradation was observed in some species. The reaction of the medium is not the only factor concerned.

Observations and experiments on cereal rusts in the neighbourhood of Cambridge, with special reference to their annual recurrence, K. C. MEHTA (*Brit. Mycol. Soc. Trans, 8 (1923), pt. 3, pp. 142–176*).—This report is in two parts, dealing, respectively, with the occurrence and overwintering of cereal rusts, and specialization of parasitism in such rusts.

Wheat black rust (*Puccinia graminis*) does not show fresh uredosori after the opening of winter. Uredospores soon lose viability on exposure to cold. This rust can not overwinter here, even as mycelium inside the host plants. Direct infection of wheat by sporidia does not occur. Apparently this rust can not originate from a mycoplasm or from intraseminal sori. The annual outbreak is explained only as due to fresh infection through aecidiospores produced on barberry.

It is stated that fresh uredosori of wheat brown rust (*P. triticina*) and the dwarf rust of barley are found during the most of the winter period, uredospores from the open during winter always giving good germination percentages. Fresh uredosori of wheat yellow rust (*P. glumarum*) were found during most of the winter of 1920-21, uredospores from such pustules always giving good germination.

For the annual recurrence of rusts the factor of greatest importance is the occurrence of uredospores on self-sown plants and tillers at the time when the autumn sown crop appears. The infection of young seedlings is followed by a comparatively long incubation period, determined partly by weather conditions, chiefly temperature. It may range from 8 to 10 days to 5 to 6 weeks. These facts are suggested as explaining sudden large-area outbreaks.

Black rust uredospores retain viability, though at rather high temperatures as compared with the behavior of yellow rust, uredospores of brown rust resisting cold as well as heat. Some of the most susceptible varieties of wheat

and barley, even when exposed in the open for over 10 months, do not become affected by yellow rust if the viability of the uredospores is impaired.

The observations and experiments recorded in this paper deny hereditary infection and explain adequately the annual recurrence of these rusts.

Inoculation experiments with pure cultures show that wheat black rust can also infect barley, but not rye or oats. The black rust of couch grass also readily infects rye and barley, and this rust can infect locally one wheat variety (Red Sudan). The black rust of barley infected barley, rye, and couch grass, but not wheat. This form is different from that on wheat and is probably identical with that on couch grass. As far as black rust is concerned, specialization is not so fixed here as has been recorded elsewhere, so that in this locality couch grass infected with this rust may cause infection of barley. The brown rust of rye is rigidly specialized. The brown rust of wheat may infect rye. The dwarf rust of barley and the yellow rust of wheat can not infect other cereals.

The common barberry and how to kill it, F. E. Kempton and N. F. Thompson (*U. S. Dept. Agr., Dept. Circ. 356* (*1925*), *pp. 4, figs. 3*).—The relation of the common barberry to stem rust of wheat is pointed out, and directions are given for the destruction of barberries by the use of salt and kerosene.

A mosaic disease of winter wheat and winter rye, H. H. McKinney (*U. S. Dept. Agr. Bul. 1361* (*1925*), *pp. 11, figs. 4*)—A description is given of a mosaic disease of winter wheat and winter rye, the occurrence of which has been noted (E. S. R., 53, p. 349) in a report on wheat rosette. The investigations on which this publication is based were carried on cooperatively with the Wisconsin and Illinois Experiment Stations, and the disease has been found on winter wheat in several localities in Illinois and Indiana, and on winter rye at the Arlington Experiment Farm, near Rosslyn, Va. The symptoms are said to be identical with those which have been described for corn and sugar cane mosaic.

In experiments carried on at the Wisconsin Experiment Station, in which an inoculum prepared from crushed stems, leaves, and leaf sheaths was used, several cases of the disease were produced. Other experiments seem to indicate the presence of the causal agents in the soil. Thus far no indications have been found of wheat mosaic being transmitted through the seed.

A leaf mottling that is not mosaic is also described.

As varietal resistance to mosaic and to leaf mottling has been noticed, the sowing of such varieties of winter wheat and rye is recommended.

Bunt in wheat and its control, H. W. Miles (*Kirton* [*Lincolnshire*] *Agr. Inst. Ann. Rpt. 1923, pp. 40–43, fig. 1*).—During 1923 stinking smut was very prevalent in wheat fields, infestations of 60 and 70 per cent being reported. Excluding proprietary applications, the author cites tests with copper sulfate, which reduces and retards germination without insuring perfect control, and with formalin, which is said to be the most satisfactory application to reduce bunt by seed treatment if carefully employed according to directions as outlined.

Control of oat smut, B. T. Dickson, R. Summerby, and J. G. Coulson (*Abs. in Phytopathology, 13* (*1923*), *No. 6, pp. 291, 292*).—Experimentation in cooperation with the Plant Protection Institute to test the efficacy of oat smut seed treatments employed the varieties Banner and Hull-less 709 M. C., in the latter of which formaldehyde spraying adversely affected germination. Banner oats in the field showed 1.5 per cent smut in the check as against no smut in plats treated with copper carbonate dust. Hull-less showed 49 per

cent in the check as against 0.3 per cent in plats treated with copper carbonate dust, which is considered almost as efficient as the formaldehyde spray and less injurious to germination.

Dusting with copper carbonate and other substances for smut control, W. P. FRASER and P. M. SIMMONDS (*Abs. in Phytopathology, 13 (1923), No. 6, pp. 293, 294*).—In experiments carried out in cooperation with the Dominion Experimental Farms at Indian Head, Rosthern and Scott, in Saskatchewan, and at Lacombe, in Alberta, copper carbonate dust, copper sulfate and lime, and other substances were used in comparison with the wet formaldehyde treatment, and in all cases the formaldehyde solution gave perfect control. Copper carbonate reduced the bunt incidence to about 0.5 per cent. With Banner oats, smut was reduced to about 1 per cent. In the case of Liberty Hull-less oats, which are seriously injured by formaldehyde, copper carbonate dust reduced the smut to a low percentage except where the checks showed severe infestation. Copper sulfate with lime and other substances used were not satisfactory.

Dwarf asparagus, M. T. COOK (*Phytopathology, 13, (1923), No. 6, p. 284*).—A disease of asparagus, previously noted in connection with *Fusarium* sp. (E. S. R., 50, p. 747), is briefly characterized. The younger the shoot, the more easily it is infected until it appears above the ground, after which it is not so likely to be attacked. Slight injury of the stems favors infection, though very young uninjured stems are also attacked. Stems over 4 in. high are not likely to become infected even if injured.

Broken seeds in maize, T. V. ZAPPAROLI (*Jour. Heredity, 16 (1925), No. 7, pp. 259–262, figs. 2*).—A type of seed defect in corn, which occurs when the kernels are hardening, appears principally in flint or intermediate flint-pop corn varieties cultivated in Italy, and is said to be the main cause of serious deterioration during winter storage. It is first manifested as a sudden cleft of the pericarp, which causes a more or less deep alteration of the underlying materials, chiefly of the aleurone layer and of the vitreous and mealy endosperm. Although definite segregation ratios are not reported, the defect seems heritable.

Studies on treatment of cotton seed, S. G. LEHMAN (*North Carolina Sta. Tech. Bul. 26 (1925), pp. 3–71, figs. 11*).—A detailed account is given of investigations on the control of cotton anthracnose, the practical results of which were noted (E. S. R., 53, p. 847). In order to discover more practical means than treating cotton seed with chemicals, hot water, or prolonged storage, the author investigated the effect of dry heat as a preventive of anthracnose.

Preliminary experiments are said to have shown that cotton seed would withstand temperatures that were inhibitive of the growth of the fungus without seriously affecting seed germination. Preheating seed for 20 to 24 hours at temperatures of from 60° to 65° C., followed by 12 hours' heating at 95° to 100°, proved effective in controlling anthracnose without materially reducing the germination of the seed. The moisture content of the seed was found to be an important factor in the vitality of the treated seed.

A machine for the treatment of seed in considerable quantity is described.

In the second part of this publication the author describes laboratory experiments conducted to determine the effects of various treatments on the germination of cotton seed. Preliminary heating at temperatures of from 40° to 60°, until the water content of the seed was reduced to 3.19 per cent of their dry weight, enabled the seed to withstand a temperature of 95° for 12 hours without impairing their vitality. In some cases accelerated germination was observed for the treated seed, and this was attributed to the effect of heat

on the seed coats. Storing seed over sulfuric acid or dry calcium oxide at room temperatures prolonged the viability of fungus. In addition to the increase in the length of the life of the fungus as a result of storing in desiccators, a second period of dormancy of the cotton seed was induced. Storing seed in hydrogen and carbon dioxide for 4 months did not reduce the viability of the fungus.

Diseases of cucumbers and melons in Iowa, I. E. MELHUS and O. H. ELMER (*Iowa Sta. Circ. 99 (1925), pp. 3–16, figs. 7*).—Popular descriptions and suggested means of control are given of anthracnose, bacterial wilt, mosaic, Fusarium wilt, and angular leaf spot.

Leaf spot of lettuce, C. G. WELLES (*Phytopathology, 13 (1923), No. 6, p. 289*).—A lettuce leaf spot, apparently undescribed hitherto, was noticed at the College of Agriculture, Los Banos, P. I., in March, 1922, disappearing with the death of the host. The plant is severely spotted, but not killed. The disease organism is briefly described and is provisionally named *Cercospora lactucae* n. sp.

Root rot and blight of canning peas, R. E. STONE (*Abs. in Phytopathology, 13 (1923), No. 6, p. 293*).—During 1922 a serious root rot and blight of canning peas appeared, becoming prominent in Prince Edward County, Ontario. The use of fertilizers in considerable quantities appeared to be of no benefit. Besides the Fusarium isolated from diseased plants, other fungi are thought to be involved. At present the suggestions for control are limited to long rotation, thorough drainage, and resistant strains.

A new downy mildew on soybeans, S. G. LEHMAN and F. A. WOLF (*Jour. Elisha Mitchell Sci. Soc., 39 (1924), No. 3–4, pp. 164–169, pls. 2*).—Soy bean is stated to be subject, as shown by specimens collected at four places in North Carolina, to a leaf spot disease believed to be now for the first time reported. The appearance of the disease and the morphology and taxonomy of the causal fungus are briefly outlined. The trouble is characterized by indefinite chlorotic areas changing to grayish brown irregular lesions with well defined dark brown borders. Conidiophores may cover thickly the lower leaf surface at the lesions. The organism is described as a new species, *Peronospora sojae*.

Bacterial spot of tomato and pepper, M. W. GARDNER and J. B. KENDRICK (*Phytopathology, 13 (1923), No. 7, pp. 307–315, pl. 1, fig. 1*).—The authors state that a few months previous to the publication of their former contribution on tomato bacterial spot (E. S. R., 45, p. 248) in which they named the causal organism *Bacterium exitiosum* n. sp., a report previously published by Doidge (E. S. R., 45, p. 849), but not accessible to them, had named this tomato spot or canker organism *B. vesicatorium*, and that on account of priority the latter name should be accepted.

Studies show the optimum temperature for colony growth to be near 27° C. (80.6° F.) The bacteria can endure short periods of freezing in water, but not exposure for several days to alternate freezing and thawing. The hosts include tomato (73 varieties), pepper (4 types), potato (leaves), currant tomato, *Solanum nigrum*, *S. dulcamara*, *S. rostratum*, *Datura tatula*, *Physalis minima*, *Lycium chinense*, *L. halimifolium*, *Hyoscyamus aureus*, *H. niger*, and *Nicotiana rustica*. Though fruit infections of tomato may result from stink-bug punctures, these lesions are not typical as are those which result from direct infection of very small uninjured fruit. The organism was able to overwinter in the field, and it survived also desiccation during 16½ months on tomato seed, disinfection of which in mercuric chloride, 1:3,000 for 5 minutes, followed by rinsing, proved effective and practicable as a control measure.

Fire blight of apples and pears, T. J. Talbert (*Missouri Sta. Circ. 137 (1925), pp. 8, figs. 6*).—Popular descriptions and suggested methods of control are given for the fire blight of apples and pears caused by *Bacillus amylovorus*.

Cedar rust of apples in Missouri, T. J. Talbert (*Missouri Sta. Circ. 135 (1925), pp. 8, figs. 6*).—Attention is called to the injury to apples by the rust *Gymnosporangium juniperi-virginianae*, which occurs on cedar trees, and the desirability of destroying cedar trees in fruit districts to prevent loss.

Diseases of plums and their control, H. R. McLarty (*Canada Expt. Farms Circ. 15 (1923), pp. 7*).—A semitechnical account is given of plum diseases of common occurrence locally and appropriate control measures and means, the diseases referred to including plum black knot (*Dibotryon morbosum*), brown rot (*Sclerotinia cinerea*), plum pocket (*Exoascus pruni*), silver-leaf (*Stereum purpureum*), shot hole or leaf spot (*Coccomyces prunophorae*), and collar rot (*Armillaria mellea*).

Strawberry diseases, N. E. Stevens (*U. S. Dept. Agr., Farmers' Bul. 1458 (1925), pp. II+10, figs. 5*).—Popular descriptions are given of a number of strawberry diseases, and for the control of the leaf diseases (leaf spot, scorch, and mildew) spraying or dusting is recommended. The frequent renewal of strawberry patches will also serve to keep these diseases in check. The diseases caused by nematodes may be avoided by planting strawberries in soils which are free from these pests, and infected land may be freed from nematodes by a three-year rotation with immune crops. Fruit rots may be reduced by proper mulching, and careful handling and adequate refrigeration will greatly lessen the loss from rots which occur after picking.

Blue stem of the black raspberry, J. F. Hockey (*Abs. in Phytopathology, 13 (1923), No. 6, p. 293*).—The black raspberry blue stem disease, as originally described by Lawrence (E. S. R., 28, p. 348), has been found in commercial plantations throughout the Niagara district. A fungus of the Verticillium type of the description given by Lawrence was readily isolated and brought under study. It is thought to be identical with *V. albo-atrum*.

The relation of insects to the transmission of raspberry leaf curl, F. T. Smith (*Jour. Econ. Ent., 18 (1925), No. 3, pp. 509–513*).—The author found *Aphis rubiphila* to be the only insect carrier of raspberry leaf curl among the several insects studied. In order to become carriers, the aphids must feed upon a diseased plant. The infective agent is not carried over winter within the egg from the fall generation to the spring forms, nor is it inherited by the offspring in viviparous reproduction. Leaf curl was transmitted from black to red raspberries, but not from red to black varieties.

Rougeau of grapevines [trans. title], L. Ravaz and G. Verge (*Compt. Rend. Acad. Sci. [Paris], 177 (1923), No. 23, pp. 1237, 1238*).—Two prevalent general cases are described, one affecting certain parts and the other the whole vine. The cause of the trouble is connected with poor root aeration and consequently checked root growth. In the dry year in question no reddening was observed.

Investigations of the blood disease of bananas in Celebes, II [trans. title], E. Gäumann (*Dept. Landb., Nijv. en Handel [Dutch East Indies], Meded. Inst. Plantenziekten, No. 59 (1923), pp. 45, pls. 2*).—Following up the report previously noted (E. S. R., 47, p. 50), the author gives an account of a more detailed study of the banana blood disease, including observations on bananas in virgin forest infected with the blood disease but not with the Javanese vascular disease, thus allowing more certain distinction as to symptoms. These include a characteristic general, proportionate reduction in growth, with results which are outlined. An acute and a chronic

phase are described. The cause is considered to be a bacillus apparently of new classification, named herein *Pseudomonas celebensis* n. sp. This appears to remain infective in the soil for at least one year, probably longer in the rotting roots. Revivals may be due partly to climatic influences. Pending control tests, sanitation is recommended.

A contribution to the knowledge of the tree-destroying fungi of the Vancouver forestry district, N. L. Cutler (*Abs. in Phytopathology, 13 (1923), No. 6, p. 294*).—After a study which was made of the tree-destroying fungi in the region of Vancouver, the author lists as important *Fuscoporia ferruginosa, Fomitiporia tsugina, Poria* sp., *P. subacida, Fomitiporella betulina, Coriolus versicolor, C. delectans, C. balsameus, C. abietinus, Piptoporus suberosus, Polyporus fissus, Lactiporus speciosus, Phaeolus sistotremoides, Fomes roseus, F. ungulatus, F. laricis, Pyropolyporus robiniae, Porodaedalea pini, Elfingia megaloma, Ganoderma oregonense, G. sessile, Daedalea confragosa, Gloeophyllum trabeum* and *G. abietinellum*. Of the species found 7 were on *Pseudotsuga taxifolia*, 12 on *Tsuga heterophylla*, 1 on *T. mertensiana*, 2 on *Picea sitchensis*, 1 on *Acer* sp., 1 on *A. macrophyllum*, 2 on *Alnus rubra*, 1 on *Rhamnus purshiana*, and 3 on undetermined hosts.

Polyporus spraguei Berk., cause of heart rot, J. R. Weir (*Phytopathology, 13 (1923), No. 6, p. 288*).—*P. spraguei* is said to cause a brown friable rot in the heartwood of the trunk and roots of living *Quercus rubra, Q. prinus, Q. coccinea, Q. velutina, Q. marylandica*, and *Castanea dentata*.

A secondary disease of oak due to Polyporus (Phellinus) rubriporus [trans. title], J. Costantin and L. Dufour (*Compt. Rend. Acad. Sci. [Paris], 177 (1923), No. 18, pp. 806–809*).—The authors have studied, in portions of the Forest of Fontainebleau, cases differing in aspect, degree, and progress of attack on *Quercus robur* by *P.* (*Phellinus*) *rubriporus*. It appears that the fungus penetrates with difficulty the living wood of this tree, requiring probably a wound for primary attack. It is thought that the area studied may have been infected all at one time some years ago.

White pine blister rust in Michigan, D. V. Baxter (*Phytopathology, 13 (1923), No. 6, pp. 285, 286*).—During the previous season, four different pine infections were located in Michigan, three of which were in Oakland County. The fourth was found in Kent County, this being the first known occurrence of white pine blister rust in the western part of Michigan.

The first blister rust infection on pine in Michigan was found near Pontiac in 1917, a year later than the first reported outbreak in Wisconsin. No blister rust was found in Michigan during the scouting seasons of 1920 and 1921. To date, all infections are traceable to white pine of French origin.

The treatment of a root disease of Borneo camphor, F. W. South (*Malayan Agr. Jour., 11 (1923), No. 7–9, pp. 217, 218*).—The treatment indicated for Borneo camphor root disease (*Rosellinia bunodes*) referred to in a previous article (E. S. R., 49, p. 548) was carefully carried out during January to April, 1921, at a cost of 79 cts. per tree, and no further cases of the disease were found. The infected areas were surrounded by trenches 2 ft. deep and 1 ft. wide placed at a distance of from 2 to 3 ft. from the suspected center. All diseased material was taken from within this patch so inclosed, which was well limed and forked. The efficiency of the lime appears to be high, as in many cases seedlings growing within a trench continued to be healthy.

Diseases and pests of rubber, F. W. South (*Malayan Agr. Jour., 11 (1923), No. 10, pp. 244–248*).—Rubber diseases reported as increasing include pink disease (*Corticium salmonicolor*), bark moldy rot (*Sphaeronema fimbriatum*),

and black stripe (*Phytophthora* sp.). Other diseases reported include brown bast, root disease (*Fomes lignosus*), wet rot (*F. pseudoferreus*), dry rot (*Ustulina zonata*), brown root disease, patch canker, die-back, and *Sphaerostilbe repens*.

A disease of dahlias, M. T. Cook (*Phytopathology, 13 (1923), No. 6, p. 285*).—A mild disease of dahlias, called to attention by M. A. Howe and determined by H. H. Whetzel as *Sclerotinia libertiana*, is briefly described as noted (but not studied) in the dahlia varieties Snowdrift and Shasta.

Gummosis in Hibiscus cannabinus on the east coast of Sumatra [trans. title], S. C. J. Jochems and J. G. J. A. Maas (*Teysmannia, 33 (1922), No. 12, pp. 542–546, pls. 2*).—On the east coast of Sumatra *H. cannabinus* is very subject to a wilt which kills the plant affected in about two days. Cultural characters and infection tests show the causal organism to be *Bacterium solanacearum*, which is more rapid in is effects on this plant than on Deli tobacco. On heavily infected land, *H. cannabinus* is practically all killed.

Bacterial soft rot of iris, J. K. Richardson (*Abs. in Phytopathology, 13 (1923), No. 6, p. 293*).—A typical soft rot in iris was tested out in connection with 36 rot-producing organisms, 2 of which gave typically diseased plants. These 2 appear to be forms of *Bacillus carotovorus*.

ECONOMIC ZOOLOGY—ENTOMOLOGY

General zoology, H. L. Wieman (*New York and London: McGraw-Hill Book Co., 1925, pp. IX+312, figs. 208*).—This is a condensed account of some of the outstanding facts and principles of zoology, selected and arranged to serve the student as a guide.

Investigations of the blood parasites of native wild birds [trans. title], W. Böing (*Centbl. Bakt.* [*etc.*], *1. Abt., Orig., 95 (1925), No. 5–6, pp. 312–327, pls. 2*).—The author reports upon the finding of parasites in birds and presents descriptions of the parasites.

The amount of strychnine in poisoned finches, J. V. Cutler (*Union So. Africa Dept. Agr. Jour., 11 (1925), No. 2, pp. 124–127*).—The results of analyses of finches poisoned by the formula recommended by the experiment station at Potchefstroom, Transvaal, viz, 1.5 lb. of flour made into a paste with water to 1 oz. of strychnine, are reported upon.

Shucking oysters: One of New Jersey's growing industries, W. H. Dumont (*New Jersey Stas. Bul. 418 (1925), pp. 24, figs. 13*).—A comparison made of salt and floated oysters (pp. 5–7) is followed by a detailed account of the shucking house, its equipment, operation, and cost. The rules and regulations governing the operation of oyster shucking houses adopted by the New Jersery State Department of Health are appended.

Index III to the literature of American economic entomology, January 1, 1920, to December 31, 1924, compiled by M. Colcord, edited by E. P. Felt (*Melrose Highlands, Mass.: Amer. Assoc. Econ. Ent., 1925, pp. [8]+441*).—This third index to the literature of American economic entomology (E. S. R., 45, p. 852) covers the five-year period from January 1, 1920, to December 31, 1924.

Common names of insects approved for general use by the American Association of Economic Entomologists (*Jour. Econ. Ent., 18 (1925), No. 3, pp. 521–545*).—This is a revised list of the common names of insects prepared by the committee on nomenclature of the American Association of Economic Entomologists. It supersedes and suppresses all previous lists.

[Report of the South Dakota Station] department of zoology-entomology, H. C. Severin (*South Dakota Sta. Rpt. 1924, pp. 22–25*).—Studies were

made of the field cricket near Newell, where it was exceptionally abundant, it not being unusual for an alfalfa seed crop to be destroyed in a few days by its attack. The studies indicate that little dependence can be placed upon natural control by its enemies. It was found that many of the eggs, which as a rule are deposited not more than 1.5 in. beneath the surface of the ground, singly and not protected by any special secretion, can be destroyed by running a spring tooth cultivator lengthwise and crosswise over the field late in the fall and again early in the spring, thus bringing them to the surface. The work of the year has shown a bait consisting of bran 25 lbs., white arsenic or Paris green 1.5 lbs., blackstrap molasses 1 gal., and water 3.75 gal. to be the most effective in killing the nymphs and adults. At least 50 per cent of the crickets were destroyed by one application of the bait in each treated field.

In investigational work with the wheat stem maggot adult, particularly with artificial control with a view to attracting the fly during its preoviposition period, a large number of materials were tested. Of these the oils were negative in their value as attractants, as was molasses alone, but molasses plus vinegar, molasses plus yeast, and several alcohols had a fair attractive power. The observation that adult flies feed upon cut ends of the leaves of freshly mown grass led to the preparation of a material obtained synthetically as an ester (new mown hay) or directly from the tonka bean in the form of coumarin, preliminary trials with which are said to look very promising.

Proceedings of the Acadian Entomological Society for 1924 (*Acadian Ent. Soc. Proc., No. 10 (1924), pp. 79, pls. 2*).—Papers presented at the annual meeting, held on April 21, 1925, include the following: Spray v. Dust on Apples in New Brunswick, by G. P. Walker (pp. 8-16); Varietal Susceptibility of the Apple to Various Injuries, by J. P. Spittall (pp. 17-22); Some Miscellaneous Insecticide Tests, by W. H. Brittain (pp. 23-42); Entomological Notes from Central New Brunswick, by W. H. Moore (pp. 43-45); Some New and Unrecorded Notes on the Life History of *Entomophthora sphaerosperma*, by F. C. Gilliatt (pp. 46-54); The Present Distribution of the European Apple Sucker (*Psyllia mali* Schmidb.), by A. G. Dustan (pp. 55-57); The Chain-dot Moth [*Cingilia catenaria* Dru.] as an Injurious Insect, by R. P. Gorham (pp. 58, 59); Insects of the Year in the Maritime Provinces, 1924, by J. P. Spittall (pp. 60–75); and Notes on the Currant Leaf-roller (*Cacoecia rosana* Linn.) in Nova Scotia, by W. E. Whitehead (pp. 76-79).

Fifty-fifth annual report of the Entomological Society of Ontario, 1924 (*Ent. Soc. Ontario, Ann. Rpt., 55 (1924), pp. 108, figs. 3*).—Papers presented at the annual meeting of this society, held at Guelph, Ont., in November, 1924, include the following: Lessons from the Grasshopper Outbreak of 1919–23 in Manitoba, by N. Criddle (pp. 13–16); The Rose Chafer and Farm Management, by W. A. Ross and J. A. Hall (pp. 16–19); The Lilac Leaf Miner (*Gracilaria syringella* Fabr.), by C. B. Hutchings (pp. 19–23); Notes on the Occurrence of the Lesser Grapevine Flea-beetle [*Altica woodsi* Isely] in Canada, by A. Gibson (pp. 23, 24); Notes on Insect Parasites of *Phyllophaga anxia* in the Province of Quebec, by C. E. Petch and G. H. Hammond (pp. 24–28); Note on *Ptinus fur* L. and *villiger* Reit. as Stored Product Pests in Canada, by C. H. Curran (pp. 28, 29); Warfare Against the Insects, by C. L. Metcalf (pp. 30–46); The Spread and Degree of Infestation of the European Corn Borer in 1924, by W. N. Keenan (pp. 47–50); Mortality of the Larvae of the European Corn Borer (*Pyrausta nubilalis* Hubn.) in the Early Instars in 1924, by L. Caesar (pp. 50–52); A Field Study of the Reduction of European Corn Borer Larvae in Standing Corn, by R. H. Painter and G. A. Ficht (pp. 53, 54); The Introduction and Colonization in Ontario of Two Hymenopterous Parasites of the European Corn Borer, by A. B. Baird (pp. 54–56); A Brief

Note on Farm Cutting Boxes and Corn Shredders as Factors in the Control of the European Corn Borer (*Pyrausta nubilalis* Hubn.), by G. A. Ficht and R. H. Painter (pp. 56, 57); Discussion on Corn Borer (pp. 57–60); The Outbreak of the Gipsy Moth in Quebec, by L. S. McLaine (pp. 60–62); A Study of the Methods Used in Growing Entomophthorous Fungi in Cages Prior to Their Artificial Dissemination in the Orchards, by A. G. Dustan (pp. 63–67); Notes from a Study of *Nepticula pomivorella* Packard, by H. Fox (pp. 67–70); Notes on the Life History of the Lesser Clover Weevil (*Phytonomus nigrirostris*), by H. F. Hudson and A. A. Wood (pp. 71–73); Entomology in the Rural Schools in the Province of Quebec, by G. Maheux (pp. 73–75); Observations on the Host-Selection Habits of *Pieris rapae* L., by C. R. Twinn (pp. 75–80); Miscellaneous Notes on the Pear Psylla Problem, by W. A. Ross (pp. 80–84); Insects of the Season, by W. A. Ross and L. Caesar (pp. 84–88); and The Entomological Record, 1924, by N. Criddle (pp. 89–106).

[Report of the] division of entomology, T. J. ANDERSON (*Kenya Colony Dept. Agr. Ann. Rpt. 1921, pp. 110–122*).—This is a brief report of the work of the year.

Manson's tropical diseases, a manual of the diseases of warm climates, edited by P. H. MANSON-BAHR (*London and New York: Cassell & Co., 1925, 8. ed., rev., pp. XX+895, pls. 33, figs. 420*).—A revised edition of this work (E. S. R., 45, p. 477), in which the section on medical zoology (pp. 633–821) has been entirely rewritten, and many new illustrations have been introduced.

Forest entomology [in British Columbia], T. D. PATTULLO (*Brit. Columbia Dept. Lands, Forest Branch Rpt. 1924, pp. E16–E18, pls. 2*).—This is largely a report of control work with the western pine beetle and mountain pine beetle in western yellow pine, and the latter species also in lodgepole and white pine, and the Douglas-fir beetle in Douglas fir. It is pointed out that an infestation of the spruce budworm and tip moth, first observed about 10 years ago, exists over a large area of spruce and balsam stands east of Quesnel, where it has become very noticeable.

A colorimetric method for showing the distribution and quantity of lead arsenate upon sprayed and dusted surfaces, C. C. HAMILTON and C. M. SMITH (*Jour. Econ. Ent., 18 (1925), No. 3, pp. 502–509, pl. 1, fig. 1*).—A discussion of the method employed at the University of Maryland.

Emulsifying agents as an inhibiting factor in oil sprays, E. R. DE ONG and H. KNIGHT (*Jour. Econ. Ent., 18 (1925), No. 2, p. 424*).—In experiments conducted with highly refined lubricating oils as sprays for the California red scale, the authors find that their insecticidal value is more a question of their mechanical properties than of any inherent toxicity. Any oil of sufficient viscosity to form a nonvolatile film that will retain its consistency for several days appears to be effective. Anything added to the oil that tends to prevent the formation or retention of this film becomes an inhibiting factor.

"In a series of tests where the oil was kept constant at 2 per cent, while the calcium caseinate, which was used as the emulsifier, was progressively reduced from 2 per cent to 0.0078 per cent, the efficiency was markedly increased as the emulsifier was decreased. In a second series of similar tests this oil was reduced to 1 per cent, and still there was a satisfactory kill with the lowest amounts of calcium caseinate. A similar series of tests was made with whale oil soap as the emulsifying agent, the oil being kept constant at 4 per cent, while the whale oil soap varied from 4 per cent to 1 per cent. The results showed a progressive increase in kill as the amount of soap was decreased, but with the least amount of soap used, namely, 1 per cent, there was not a complete kill of the scales."

Cold process oil emulsions, W. W. Yothers (*Jour. Econ. Ent., 18 (1925), No. 3, pp. 545, 546*).—The author gives formulas for cold process oil emulsions, in which kaolin, glue, and skim milk powder are used as emulsifiers. All of these are said to have been made with ease and to be of fixed value.

Some spray tests with oil emulsions, L. L. Huber (*Jour. Econ. Ent., 18 (1925), No. 3, pp. 547, 548*).—A brief discussion is given of certain quantitative changes which emulsions undergo during the process of manufacture, under the general topic of viscosity. Data obtained in an experiment at the Illinois Experiment Station, which are tabulated, tend to prove that the several factors, especially the ratio of oil, water, and soap, have an important bearing on the kill of scale.

A preliminary report on the preparation of insecticide emulsions with a colloidal clay, L. L. English (*Jour. Econ. Ent., 18 (1925), No. 3, pp. 513–515*).—The author reports upon the use of bentonite, a colloidal clay, as an emulsifier for kerosene, red engine oil, paraffin oil, and furfural. The experiments included tests on potted bean plants for injury and tests on one species of aphid (*Amphorophora rhois* Monell) for insecticidal properties. The tests on this aphid indicated that paraffin oil and red engine oil emulsions compare favorably with the miscible oils. Kerosene emulsion was not as effective as the other oils. Furfural emulsions at a strength of 15 per cent gave approximately the same kill as the other sprays at 2 per cent strength. Emulsions made with soap were slightly more effective than those made with bentonite.

Fumigation of citrus trees, D. B. Ferguson (*Agr. Gaz. N. S. Wales, 36 (1925), No. 6, pp. 437–444, figs. 7*).—The author here presents notes on recent developments in California, based upon two years' work in the State.

[Quarantine control of insect pests] (*Jour. Econ. Ent., 18 (1925), No. 3, pp. 481–492*).—Papers on control work with insects by quarantine include The Methods Employed in Enforcing the Gipsy Moth and Brown Tail Moth Quarantine, by D. M. Rogers (pp. 481–487); Port Inspection and a Few of the Problems Which Are Encountered, by L. A. Strong (abs., p. 487); and The Japanese Beetle Quarantine, by C. W. Stockwell (pp. 488–492).

The Orthoptera injurious to cotton and other economic plants in French West Africa [trans. title], P. Vayssière and J. Mimeur (*Agron. Colon., 12 (1925), No. 89, 203–224, pls. 3, fig. 1*).—A discussion of the more important forms of Orthoptera.

The fungous disease of locusts, S. H. Skaife (*Union So. Africa Dept. Agr. Jour., 11 (1925), No. 2, pp. 179–185, figs. 4*).—This is a report on a preliminary investigation of an epidemic among locusts in Southwest Africa during the season of 1925, due to the parasitic fungus *Empusa grylli*. The epidemic was so deadly, due to the warm, moist conditions, that in a short time the northern half of the country was almost completely cleared of the locusts.

Locust egg parasite (*Union So. Africa Dept. Agr. Jour., 11 (1925), No. 2, p. 105*).—Observations indicate that the dipteran *Stomatorrhina lunata* Fab. is destroying large numbers of locust eggs in Middelburg, Cape Colony.

Destruction of cockroaches and devitalization of their eggs by cyanogen-chloride mixture, C. E. Rice (*Pub. Health Rpts. [U. S.], 40 (1925), No. 35, pp. 1808–1811*).—The author finds that, with a ship properly closed and sealed, the cyanogen chloride and hydrocyanic gas developed by 4 oz. of sodium cyanide to each 1,000 cu. ft., in conjunction with sodium chlorate and hydrochloric acid, will kill practically all German cockroaches in a two-hour exposure. A four-hour exposure would be more efficient, as the gas would then reach the roaches that were too well protected by cover to be reached by a shorter exposure. The same gas in the same time will kill the eggs of the roaches unless they are too well protected. If a second fumigation is to follow

the first for the purpose of killing the young that have hatched from eggs that escape the first fumigation, at least two weeks should elapse, and, preferably, a period of six weeks, before the second fumigation.

The delayed dormant oil spray for killing apple red-bug eggs, S. W. Frost (*Jour. Econ. Ent., 18 (1925), No. 3, pp. 516–519*).—The author's investigations indicate that some degree of control of the red bug (*Lygidea mendax* Reut.) can be expected by killing the eggs with the delayed dormant application of certain oil sprays.

Dusting for control of the citrus aphid, C. E. Whittington (*Citrus Indus., 6 (1925), No. 6, p. 6*).—The author reports that in several trials made at night nicotine sulfate gave practically 100 per cent kill. The best kills were obtained on calm nights when there was no trace of breeze, and it is useless to dust at any other time. Low temperature is said to have little or no effect on the killing power of nicotine dust, the best kills having been obtained on the coldest nights in March. The first application of 550 lbs. of 3 per cent nicotine sulfate dust cost less than $85, being applied at the rate of 0.25 lb. per tree to 40 acres of 8-year-old trees. Applications should follow from 7 to 10 days apart until the growth is too hard for the aphid to injure.

Subterranean aphids of Ohio, C. R. Cutright (*Ohio Sta. Bul. 387 (1925), pp. 175–238, figs. 56*).—Following a brief introduction, the author presents a list of 21 species of undergound aphids found in Ohio and another species which may be expected, a key to subterranean genera, and a discussion of subterranean aphids in general. An account of the biology and synonymy of the species, including tables for their separation, which follows, deals with *Anoecia corni* Fab., *A. querci* (Fitch), the clover aphid, the thorn leaf aphid (*Anuraphis crataegifoliae* (Fitch)), the corn root aphid, *A. middletonii* (Thos.), *A. viburnicola* (Gill.), the black peach aphid, the strawberry root louse (*Aphis forbesi* Weed), the rusty plum aphid, the apple grain aphid, the cockscomb gall aphid of elm (*Colopha ulmicola* (Fitch)), the woolly apple aphid, *Tetraneura graminis* Monell, *Pemphigus lactucae* (Fitch), the cottonwood petiole gall (*P. populi-transversus* Ril.), the wooly alder aphid, the white aster root louse (*Prociphilus erigeronensis* (Thos.)), *Forda formicaria* Hey., *F. olivacea* Rohw., *Geoica squamosae* Hart, and *G. radicola* (Essig). This is followed by a discussion of the control of subterranean aphids, including experimental work against the white aster root louse and the black peach aphid.

In investigations of *P. lactucae*, it was found that, at temperatures ranging from 65 to 75° F., aphids on a heavily infested plant survived seven days when placed under water, after which period the mortality rapidly increased. Unlike most subterranean aphids, this species appears to be independent of ants. Experiments with *P. erigeronensis* have shown that it may pass the winter in at least two ways, most commonly in the nest of ants, but also alone in the soil. In control work with this species, tests were made of calcium cyanide, carbolineum avenarius, carbon disulfide, carbon disulfide emulsion, corrosive sublimate, nicotine sulfate, paradichlorobenzene, sulfur, and tobacco dusts. The most practical method proved to be the use of nicotine sulfate at a strength of 1 teaspoonful to 1 gal. of very soapy water, first pulling away a small amount of earth from the roots and then pouring about them from 1 pint to 1 quart of the solution.

In control work with the black peach aphid materials were used before planting, at the time of planting, and at the time of aphid attack. While no definite control for this species has been discovered, it is recommended (1) that, unless trees are known to be free from the insect, they be dipped at the time of planting in a strong nicotine sulfate and soap or oil emulsion

solution, (2) that paradichlorobenzene be applied about the tree at the rate of ¼ to ⅕ oz. per tree when aphid work is first noted, and (3) that, if aphids appear on the tops of the trees, they be sprayed with a solution of ¾ pint of 40 per cent nicotine sulfate and 4 lbs. of soap, or ½ gal. of stock oil emulsion, or ½ gal. of miscible oil to 100 gal. of water. For dipping 50 gal. of water and the remainder of the formula as above is recommended and for spraying 1 teaspoonful of nicotine sulfate to 1 gal. of very soapy water.

The bulletin concludes with recommended controls for the corn root louse, black peach aphid, strawberry root louse, wooly apple aphid, and the white aster root louse.

A list of British aphides, J. Davidson (*London and New York: Longmans, Green & Co., 1925, pp. XI+176*).—In this work the author has brought together all the known British species of the superfamily Aphidoidea, together with their important synonyms and their distribution and food plants as recorded in Great Britain. Section 1 (pp. 1–96) consists of a list of the aphid species of Great Britain, together with their important synonyms and their food plants and distribution as recorded there; section 2 (pp. 97–110) consists of a list of the genera of aphids of Great Britain, together with critical notes and important synonyms; section 3 (pp. 111–158) consists of a list of the food plants upon which the aphids listed in the first section have been recorded in Great Britain, together with the species of aphids found on them; and section 4 (pp. 159–176) consists of a bibliography of the Aphidoidea.

The nim mealy scale (Pulvinaria maxima Green), T. V. Ramakrishna Ayyar (*India Dept. Agr. Mem., Ent. Ser., 8 (1925), No. 12, pp. 127–155, pls. 5, figs. 14*).—This is a report of investigations of *P. maxima*, which frequently causes considerable damage in south India to the very common shade tree *Azadarachta indica*.

The camphor scale situation, H. K. Plank (*Jour. Econ. Ent., 18 (1925), No. 3, pp. 473–481*).—This is a report of the present status of the camphor scale, *Pseudaonidia duplex* (Ckll.), and control work under way.

Embryology of coccids, with especial reference to the origin and differentiation of ovarian elements, germ layers, nervous and digestive systems, G. O. Shinji (*Bul. Imp. Col. Agr. and Forestry, Japan, No. 6 (1924), pp. [3]+61, pls. 14*).—This report of studies by the author includes a bibliography of 75 titles.

Chicken lice and mites and their control, G. W. Herrick (*N. Y. Agr. Col. (Cornell) Ext. Bul. 115 (1925), pp. 17, figs. 8*).—This is a practical summary of information.

Results of the fifth year's work against the gipsy moth in New Jersey, H. B. Weiss et al. (*N. J. Dept. Agr. Circ. 89 (1925), pp. 19, figs. 13*).—In control work conducted in New Jersey during the fiscal year ended June 30, 1925 (E. S. R., 52, p. 557), only 3 colonies, with a total of 15 new egg masses, were discovered.

Codling-moth in apricots, F. W. Pettey (*Union So. Africa Dept. Agr. Jour., 11 (1925), Nos. 1, pp. 56–65, figs. 5; 2, pp. 137–152, figs. 8*).—This is a preliminary report on the biology of the codling moth and its control in apricots in Wellington. It is gradually spreading throughout the district, being a serious pest of apricots in orchards located even 0.5 mile or more from apple and pear trees, and it is also attacking Kelsey and Wickson plums.

The pink bollworm (Pectinophora gossypiella), A. Gallwey (*West Indies Imp. Dept. Agr., Montserrat Agr. Dept. Rpt., 1922–23 and 1923–24, pp. 17–20*).—The results of examinations of cotton bolls collected from estate fields on Montserrat during a period of two years, which demonstrate the rapid

extension of damage made by this pest over a comparatively short interval of time, are presented in tabular form. In the treatment of cotton seed for the destruction of the pink bollworm, it was found that fumigating twice with carbon disulfide at the rate of 1 lb. per 120 cu. ft. of space, or twice with the second dose at one-half extra rate, gave comparable germination results, which led to fumigation of all the seed planted in 1923 by the double method, as an extra measure of precaution. Every ginnery was compelled to erect a fumigatorium for handling the daily output of seed to meet the requirement that all cotton seed be fumigated.

Remarks on the number of generations of the European corn borer in America, G. W. Barber (*Jour. Econ. Ent., 18 (1925), No. 3, pp. 496–502*).—This is a discussion of the two geographical races of the European corn borer which now occur in the United States, based upon life history studies.

Fruit-piercing moths (*Union So. Africa Dept. Agr. Jour., 11 (1925), No. 2, pp. 103, 104*).—Most of the serious damage caused by fruit-piercing moths in the eastern Cape districts, reported by D. Gunn, would appear to have been due to *Achaea lienardi*.

The sheep nasal-fly (Oestrus ovis Linné.), G. A. H. Bedford (*Union So. Africa Dept. Agr. Jour., 11 (1925), No. 2, pp. 119–123, figs. 3*).—A brief summarized account of this dipteran, with control measures.

Papers on Indian Tabanidae, IV–VII, P. V. Isaac (*India Dept. Agr. Mem., Ent. Ser., 8 (1925), No. 10–11, pp. 93–109, pls. 5, figs. 7*).—This continuation of the papers previously noted (E. S. R., 53, p. 55) includes Notes on the Life-history of *Tabanus striatus* Fabr. (=*hilaris* Wlk.) (pp. 108, 109), etc.

A comparative study of rat-flea data for several seaports of the United States, C. Fox and E. C. Sullivan (*Pub. Health Rpts. [U. S.], 40 (1925), No. 37, pp. 1909–1934, figs. 16*).—The authors point out that in New Orleans, where plague has actually existed, *Xenopsylla cheopis* Roths is the predominant rat flea present during every month of the year, and that *Ceratophyllus fasciatus* Bosc. is practically absent. In the northern cities under study, where plague has never existed, *C. fasciatus* is the predominant rat flea, *X. cheopis* appearing in greater numbers only during a few months of the year.

The economic importance and control of the sal heartwood borer (Hyplocerambyx spinicornis Newm., fam. Cerambycidae), C. F. C. Beeson and N. C. Chatterjee (*Indian Forest Rec., 11 (1925), No. 8, pp. [5]+47, pls. 8*).—A report of control work with this important borer.

The control of the shot-hole borer of tea (Xyleborus fornicatus Eichh.), F. P. Jepson and C. H. Gadd (*Ceylon Dept. Agr. Bul. 72 (1925), pp. 46, pls. 4*).—This report of control work with *X. fornicatus* is in two parts, the first being by Jepson (pp. 1–27) and the second, which deals with the analysis of field data, by Gadd (pp. 27–45).

The Mexican bean beetle: A new pest of garden beans in Ohio, T. H. Parks (*Ohio Agr. Col. Ext. Bul., 20 (1925), No. 9, pp. 12, figs. 11*).—This is a practical summary of information on the Mexican bean beetle in Ohio.

Note on the sweet-potato leaf-beetle and a related Mexican form, F. H. Chittenden (*Bul. Brooklyn Ent. Soc., 20 (1925), No. 2, pp. 91, 92, fig. 1*).—This note relates to *Typophorus viridicyaneus* Crotch, which has been recorded as attacking sweet potatoes in Texas, Arkansas, Mississippi, and North and South Carolina. A comparison is made with the Mexican form, which is designated as *T. viridicyaneus sturmi* Lefèvre.

Control measures for blister beetles, W. J. Baerg (*Arkansas Sta. Bul. 201 (1925), pp. 8, figs. 4*).—The author gives an account of four species of blister beetles which are most commonly found attacking farm and garden

crops in Arkansas, namely, the striped, ash-gray, margined, and black blister beetles.

In experimental control work an application of calcium arsenate dust failed to have any effect, while a mixture of equal parts of sodium fluosilicate and hydrated lime destroyed all the beetles in 48 hours. Tests made on beetles in battery jars containing a bit of foliage dusted with the mixture resulted in about 100 per cent kill. The tests showed the poison to be remarkably slow in its action. In from 45 to 60 minutes the beetles gradually begin to show signs of illness, they appear sluggish and seem to lose control of their legs, and die in from 24 to 48 hours after the poison has been applied. Field tests with sodium fluosilicate repeated on small infestations of the striped blister beetle on alfalfa also gave satisfactory control. Sodium fluosilicate diluted with an equal quantity of hydrated lime caused no appreciable injury to soy beans and alfalfa, and a liberal application to tomato and potato plants showed that it can be safely used upon them. A clematis vine, however, was severely burned when dusted with the material.

Boll weevil control tests (*Georgia Coastal Plain Sta. Bul. 5 (1925), pp. 19–21*).—Tests of different methods of poisoning with calcium arsenate for the control of the boll weevil during the year showed in a conclusive manner the beneficial and economical results of presquare poisoning with a homemade sirup mixture consisting of 3 lbs. of calcium arsenate, 1 gal. of molasses, and 3 gal. of water, which was applied with a hand mop to the growing points of the plant. The first application was made a week to 10 days before the first squares appeared, and two to three subsequent applications were made at weekly intervals. It is pointed out that later applications may be made most effectively with calcium arsenate dust applied with a good dusting machine.

Textbook of apiculture, H. FREUDENSTEIN (*Lehrbuch der Bienenzucht. Marburg, Germany: Neue Bienenzeitung, 1924, 6. ed., rev. and enl., pp. XVI+466, figs. 246*).—The first part of this work deals with the life of the bee (pp. 9–80), part 2 with the practice of beekeeping (pp. 81–192), part 3 with seasonal work with bees (pp. 193–358), and part 4 with diseases and enemies of bees, winter work, etc. (pp. 359–466).

[Apiculture] (*Jour. Econ. Ent., 18 (1925), Nos. 2, pp. 369–410, pls. 2; 3, pp. 441–467*).—Papers presented before the apiculture section of the American Association of Economic Entomologists in December, 1924, include the following: Research Problems Adapted to Graduate Students, by F. B. Paddock (pp. 369–372); Are Commercial Honey Shipments Largely Responsible for the Dissemination of American Foulbrood? by S. B. Fracker (pp. 372–380); The Moults of the Honeybee, by L. M. Bertholf (pp. 380–384); The New Method of Sterilizing Combs Affected with American Foulbrood so that They May Be Used Again with Perfect Safety, by E. R. Root (pp. 384–387); The Honeybee as an Agent in the Pollination of Pears, Apples, and Cranberries, by R. Hutson (pp. 387–391); The Status of Isle of Wight Disease in Various Countries, by E. F. Phillips (pp. 391–395); The Relation of Stores to Brood Rearing, by J. H. Merrill (pp. 395–399); The Relation of *Bacillus alvei* to the Confusing Symptoms in European Foulbrood, by A. P. Sturtevant (pp. 400–405); The Storing and Ripening of Honey by Honeybees, by W. Park (pp. 405–410); The Seventh International Apicultural Congress, by E .F. Phillips (pp. 441–445); Notes on Bee Diseases in Connecticut, by P. Garman (pp. 445–447); The Quantitative and Qualitative Effect of Weather Upon Colony Weight Changes, by J. I. Hambleton (abs. pp. 447, 448); The Sense of Smell Again, by W. A. Price (pp. 448–450); Federal Cooperation in Apiary Inspection Proposed, by

S. B. Fracker (pp. 450–454); and Inspection Methods in Various States—Symposium (pp. 455–467).

Report of the Dominion apiarist for the year 1924, C. B. GOODERHAM (*Canada Expt. Farms, Bee Div. Rpt. 1924, pp. 16, figs. 3*).—This report covers the work of the year in the field of apiculture, much of the data being presented in tabular form.

Infectious diseases of the honeybee, A. BORCHERT (*Die Seuchenhaften Krankheiten der Honigbiene. Berlin: Richard Schoetz, 1924, pp. V+76, figs. 17*).—This is an account of the infectious diseases and parasitic affections of the bee.

Wax moth parasite, R. G. RICHMOND (*Jour. Econ. Ent., 18 (1925), No. 2, p. 425*).—The author records the parasitism of the wax moth at Fort Collins, Colo., by *Nemeritis canescens* Grav.

Hymenoptera of Spain: Ichneumonidae [trans. title], G. CEBALLOS (*Mem. R. Acad. Cien. Exact., Fis. y. Nat. Madrid, 31 (1925), pp. 293, figs. 200*).—This is a synopsis of the Ichneumonidae, with a bibliography of four pages.

The woolly aphis parasite (Aphelinus mali), G. T. LEVICK (*Jour. Dept. Agr. Victoria, 23 (1925), Nos. 3, pp. 171–173, fig. 1; 6, pp. 363–366, figs. 3*).—A brief account of this chalcid, which has been introduced from New Zealand into Australia, where it has become of great economic value in combating the wolly apple aphid.

An introductory study of the Acarina, or mites, of Ohio, A. E. MILLER (*Ohio Sta. Bul. 386 (1925), pp. 85–172, figs. 16*).—The author records 127 species of Acarina as known to occur in Ohio, 28 of which are of direct ecoomic importance because of their actual or potential capacity to cause losses to human industries. In his discussion of these species, the author includes an account of the most effective practical control thus far known.

ANIMAL PRODUCTION

Observations on reproduction and rearing of young by the rat as influenced by diet, N. SIMMONDS (*Amer. Jour. Hyg., 4 (1924), Sept. Sup., pp. 108*).—The effects of different diets on the fertility, mortality, rate of growth, length of suckling period, and other characteristics indicating optimum conditions in the rat have been studied and data collected in experiments carried on over a period of 9 years at Johns Hopkins University. It has been found that the production of normal growth is not positive proof that a ration is adequate, but that the ability to reproduce and normally raise young on such a diet is a necessary test for determining the adequacy of the ration. Rats under optimum conditions are very fertile and are able to raise practically all of their young without the loss of much weight by the female. The rations fed have frequently been deficient in various substances in order to determine the ability of the mother to synthesize the necessary material in the milk.

The experiments showed that lactating rats fed diets lacking in vitamin A or B could not raise their young and, therefore, could not synthesize these substances. The effects of complete diets containing from 9 to 67 per cent of protein supplied from the various cereal and legume seeds and animal tissues have been studied. The higher protein diets, containing from 35 to 67 per cent of protein, were found to allow normal fertility, growth of young, and milk secretion, but there was evidence of a progressive kidney degeneration accompanying such feeding. The supplementing values of the proteins of cereal seeds and animal tissues were studied, using diets containing 9 per cent of protein, 6 per cent of which was supplied by the cereal and 3 per cent by the animal tissue. Wheat and rolled oats proteins were effectively supple-

mented by the proteins of muscle tissue, while the proteins of liver and kidney proved satisfactory supplements for rye and wheat proteins. On the 9 per cent protein rations the nursing periods were long and senility came at an early age.

In tests of the biological value of protein combinations consisting of 6 per cent of cereal protein and 3 per cent of protein from legume seeds, it was found that these combinations were inadequate, growth being only fair, fertility low, mortality of the young high, and cannibalism by the mothers frequent, as well as the occurrence of other conditions indicative of inadequate rations.

In studies of rickets, the optimum consumption of calcium and phosphorus was found to be 0.65 and 0.40 gm., respectively, per 100 gm. of food. Animals receiving small amounts of calcium in the ration, with 2 per cent of cod liver oil, were able to grow at about one-half the normal rate and produce young, but they frequently suffered a complete breakdown after one or two litters, due to the loss of calcium from the skeleton. Fertility was increased when cod liver oil was supplied to diets sufficiently low in calcium to cause sterility. Cod liver oil proved superior to butterfat in aiding calcium assimilation.

The need is pointed out of supplying the mother with an adequate diet containing the proper quantity and quality of proteins, vitamins, inorganic elements, and carbohydrates or fat for energy in order that milk may be produced which will induce optimum growth in the young.

The utilization of oil meals in the feeding of animals [trans. title], M. BERNARD (*Jour. Sta. Agron. Guadeloupe, 5 (1925), No. 1, pp. 21–26*).—The high protein and phosphorus contents of oil meals are pointed out, and the use of oil meal in the rations of the different classes of animals is briefly discussed.

The influence of the hulls on the composition and nutritive value of sunflower seed cake [trans. title], A. ZAITSCHEK and E. JALOWETZ (*Kisérlet. Közlem., 27 (1924), No. 1–2, pp. 16–25*).—The digestibility of sunflower hulls was found to be very low in experiments with wethers. From these results the starch value was calculated at 3.05 per cent, while the starch value of sunflower seed oil cake was 67.34 per cent. The addition of 20 per cent of hulls to the oil cake was shown to lower the nutritive value materially. Increases in the amount of hulls by 1 per cent lowered the protein 0.35 per cent, the fat 0.1, and the starch value 0.65 per cent, and increased the crude fiber content by approximately 0.37 per cent. It is stated that the best quality of sunflower seed cake should contain less than 21 per cent of fiber and its starch value should be about 66 per cent.

The nutrient value of some weed seeds [trans. title], I. WEISER (*Kisérlet. Közlem., 27 (1924), No. 1–2, pp. 1–15*).—The composition, digestibility, and digestible nutrients in the seeds of *Agrostemma githago, Lathyrus aphaca, Ranunculus arvensis, Plantago lanceolata,* and Cirsium are reported, as determined in feeding experiments with wethers. The composition of other weed seeds is also given.

The regression of age with size; a neglected aspect of growth, F. W. WEYMOUTH, H. C. MCMILLIN, and W. H. RICH (*Soc. Expt. Biol. and Med. Proc., 22 (1925), pp. 339–342, figs. 2*).—The authors point out that the ordinary means of measuring growth as the average weight or length at a given age give only a portion of the desired picture, and that the average age of individuals of a certain size should be considered. Other advice relative to the proper interpretation of growth data is given.

Empirical formulae for the proportionate growth of the human fetus, L. A. CALKINS and R. E. SCAMMON (*Soc. Expt. Biol. and Med. Proc., 22 (1925), pp. 353-357*).—Measurements of 70 dimensions of from 207 to 369 preserved human fetuses were plotted against the crown-heel length. In 19 cases the curves constructed approximated straight lines, and in 41 instances the curves approximated straight lines except at the upper ends. In 9 cases 2 straight lines meeting at about the middle of the distribution were found to apply, while in 1 case the relation in the lowered ranges was a straight line and a curved line in the upper ranges. The 41 departures from a straight line were found to be due to the effects of birth molding, to changes in the form of the chest following birth, and to formalin artifacts. Constants for correcting these curves to straight lines were calculated. The cause of the departure of the other curves was not determined, and corrections could not be made.

The authors conclude that "the growth in length, girth, and diameter of the various external divisions of the body is directly proportional to the growth in total body length in the fetal period (from at least 3 fetal months to birth)." The growth rates of parts located in the same region were found to be similar while disinct differences were evident in the different regions.

Steer feeding experiment, W. H. FAIRFIELD and V. MATTHEWS (*Canada Expt. Farms, Lethbridge (Alta.) Sta. Rpt. Supt. 1923, pp. 6–8*).—Four lots of 11 steers each were selected for comparing various roughages for fattening steers in a 167-day experiment. All lots received an equal amount of grain, consisting chiefly of ground oats and barley. In addition lot 1 received alfalfa hay, lot 2 alfalfa hay and corn silage, lot 3 alfalfa hay and sunflower silage, and lot 4 alfalfa hay and corn fodder. At the beginning of the experiment the steers averaged approximately 1,135 lbs. in weight. The average daily gains per head were, for lot 1, 1.61 lbs.; lot 2, 2.4; lot 3, 1.69; and lot 4, 1.96 lbs. The feed requirements per 100 lbs. of gain in the different lots were as follows: Lot 1, 587 lbs. of grain and 1,407 lbs. of hay; lot 2, 394 lbs. of grain, 417 lbs. of hay, and 1,271 lbs. of silage; lot 3, 558 lbs. of grain, 487 lbs. of hay, and 1,800 lbs. of silage; and lot 4, 483 lbs of grain, 545 lbs. of hay, and 679 lbs. of corn fodder. It is stated that the steers receiving corn silage attained a better finish than the other groups, while there was little difference between those receiving sunflower silage and those getting no silage.

The sterility of cows [trans. title], S. FREUND and A. ROSEN (*Zionist Organ. Inst. Agr. [etc.] Agr. Expt. Sta. Ext. Circ. 4 (1925), pp. 10*).—A popular discussion of the causes of sterility in cattle, with suggestions for the prevention and treatment of sterility.

[The effects of] dehorning, W. W. BAIRD (*Canada Expt. Farms, Nappan (N. S.) Farm Rpt. Supt. 1923, pp. 10, 11*).—The effects of dehorning were studied on 18 yearling steers dehorned on April 13 and 20 steers dehorned on November 17. The results showed that the yearlings suffered slight losses during the first two weeks after dehorning, while the other steers made an average daily gain of 0.83 lb. during the first two weeks following the operation. It is pointed out that any losses accompanying dehorning will be more than made up during the feeding period.

Breeding of Romney-cross sheep, J. G. COOK (*New Zeal. Jour. Agr., 30 (1925), No. 4, pp. 213-219, figs. 5*).—The results of five years' experiments in improving the fleece of ewes at the Wallaceville Farm of the New Zealand Department of Agriculture are popularly reviewed. The original ewes were rather low-grade wool producers, but by the use of two Romney rams the quality of the fleeces of the flock has been materially improved.

[Swine feeding experiments at the Huntley, Mont., Reclamation Project Experiment Farm], A. SEAMANS and R. E. HUTTON (*U. S. Dept.*

Agr., Dept. Circ. 330 (1924), pp. 18–21, 27–31, fig. 1).—The results of pasturing and feeding experiments conducted during 1922 are reported, many of which are continuations of those previously noted (E. S. R., 49, p. 872).

Experiments in pasturing dry-land crops with hogs.—The investigation of the use of dry-land grain and forage crops for hog pasture was continued. One acre plat each of winter rye, field peas, beardless barley, and corn was used for the tests with annual crops. Ten pigs averaging 104 lbs. in live weight were pastured on the rye for 37 days, beginning May 24, followed by 11 days on the peas, 22 days on the barley, and 43 days finishing in dry lot on corn and tankage self-fed. A 2 per cent corn ration was fed with the rye and pea pastures. The pigs made average daily gains of 0.59, 0.78, 0.36, and 1.72 lbs. per head during the different periods on rye, peas, barley, and in dry lot, respectively. A check lot self-fed corn and tankage for 67 days in dry lot made an average daily gain of 1.37 lbs. One acre of corn was stocked on September 13 with 8 pigs averaging 70 lbs. Alfalfa hay was also available. During the 31-day pasturing period an average daily gain of 0.94 lb. was made. In the tests with the perennial pastures, 0.5-acre plats of alfalfa sown in rows 2 ft. apart and sown broadcast were each pastured for 56 days with 3 pigs. Two per cent rations of corn per 100 lbs. of live weight were supplied in addition. The average daily gain made on the pasture sown in rows was 0.92 lb. and on the broadcast pasture 0.82 lb. The former pigs averaged 109 lbs. and the latter 76 lbs. in initial weight. A 0.5-acre plat of brome grass seeded in rows and pastured for 56 days by 3 pigs averaging 103 lbs. in live weight produced, with a 2 per cent ration of corn, an average daily gain of 0.82 lb. Two 93-lb. pigs similarly pastured on 0.25 acre of brome grass sown broadcast made an average daily gain of 0.61 lb.

A varying grain ration compared with a stationary ration for spring pigs on alfalfa pasture.—Two lots of 12 pigs each, averaging approximately 40 lbs. in live weight and pastured for 104 days on 0.5-acre plats of alfalfa, were used for comparing supplements of 2 lbs. of corn per 100 lbs. of live weight with 1.5 lbs. of corn per pig. The animals receiving the uniform ration of corn throughout made 4.1 lbs. more gain per head but required 22 lbs. more grain to produce 100 lbs. of gain than the pigs receiving the 2 per cent ration. In a 68-day dry lot feeding period on corn and tankage, the former lot made slightly more rapid and more economical gains.

Skim milk as a substitute for grain for spring pigs on alfalfa pasture.—In studying the value of skim milk as a supplement to alfalfa pasture, 2 lots of pigs were selected and compared with the lot receiving a 2 per cent corn ration in the above experiment. For one of the lots skim milk replaced the grain at the rate of 4 lbs. per pound of grain, and for the second lot skim milk replaced one-half of the grain at the same rate. The results showed that when no grain was fed the pigs became unthrifty, and the average daily gain made was only 0.24 lb. With one-half of the grain replaced by skim milk the gain was 0.43 as compared with 0.52 lb. for the lot receiving the 2 per cent corn ration.

Comparison of Northwestern Dent and No. 2 Yellow corn as feed for hogs.—A lot of 12 pigs self-fed on No. 2 Yellow corn and tankage made an average daily gain of 1.6 lbs. per head as compared with 1.49 lbs. by another lot receiving Northwestern Dent corn. The feed required per 100 lbs. of gain was 392 lbs. by the former and 430 lbs. by the latter lot.

Pasturing alfalfa with hogs.—The continuation of the study of the rotation pastures begun in 1914 is given. Quarter-acre plats of third year alfalfa were pastured by fall pigs from May to July and by spring pigs from July

to August. During the spring pasturing period on two of the rotation pastures average daily gains of 0.86 and 0.91 lb. per head were made, and the estimated grain saved per acre of pasture was 808 and 1,045 lbs. as determined by comparing with a similar lot of pigs fed in dry lot. In the summer pasturing period on the same rotations average daily gains of 0.58 and 0.57 lb. were made at an estimated saving of 2,668 and 2,511 lbs. of grain per acre of pasture. The results for each year from 1914 to 1922 are tabulated.

Pasturing corn with hogs.—In continuing the studies of hogging off corn with and without rape sown in between the rows, it was found that the pigs made a total gain of 932 lbs. per acre from hogging off the corn alone as compared with 842 lbs. from hogging off the corn and rape. The combined results for the 11 years' tests of hogging off corn alone and the 7 years' tests of hogging off corn and rape indicate an advantage for corn and rape. It was estimated that 463 lbs. of grain were required per 100 lbs. of gain in the former case and 418 lbs. of grain in the latter.

Tankage and buttermilk as protein supplements for growing pigs, E. F. Ferrin and M. A. McCarty (*Minnesota Sta. Bul. 221 (1925), pp. 10, fig. 1*).—The results are given of two experiments in comparing tankage, dried buttermilk, semisolid buttermilk, and creamery buttermilk for growing pigs when used as supplements to shelled corn fed dry and red dog flour mixed as a slop with the protein feeds. Four lots of 10 pigs each, averaging approximately 73 lbs. in weight, were fed in each trial until the pigs reached an average of 175 lbs. Some rape was available each year.

Both experiments showed some advantage for the buttermilk feeds over the tankage, both in the rate of gain and amount of corn and red dog flour required per unit of gain. All lots made slightly larger daily gains in the second trial than in the first. Averaging the results of the two experiments, the lots receiving tankage made an average daily gain of 1.12 lbs., while the lots receiving the three kinds of buttermilk all made average daily gains of 1.21 lbs. The lots receiving tankage required 273 lbs. of corn per 100 lbs. of gain, while those receiving dried buttermilk, semisolid buttermilk, and creamery buttermilk required, respectively, 247, 240, and 248 lbs. of corn per 100 lbs. of gain. The estimated costs per unit of gain were lowest when tankage was fed and highest for the two lots receiving the commercial buttermilk products.

Comparison of minerals for swine, W. L. Robison (*Ohio Sta. Bimo. Bul., 10 (1925), No. 8, pp. 146–153*).—The results of experiments reported (E. S. R., 45, p. 674) have indicated that rations of corn and vegetable proteins were deficient in minerals. The results of several experiments to test the comparative value of various minerals as supplements to corn fed with soy bean oil meal are reported, some of which have been previously noted (E. S. R., 50, p. 171).

In an experiment begun December 16, 1924, 9 lots of 8 pigs each, averaging approximately 44 lbs. in live weight at the beginning of the experiment, were self-fed corn and soy bean oil meal with minerals mixed into the ration. One lot received salt at the rate of 0.5 per cent of the total ration, while the others received mineral mixtures at the rate of 2.5 per cent of the grain mixture fed. The mineral mixtures consisted of salt and ground limestone for lot 2, with the addition of raw bone meal, bone black, treble superphosphate, acid phosphate, ground rock phosphate, and raw bone meal and hardwood ashes, respectively, for lots 3 to 8. Lot 9 received a mineral mixture of salt, hardwood ashes, and acid phosphate. The results showed that the pigs receiving salt as the only mineral suffered greatly from stiffness beginning with the tenth to the thirteenth week of the feeding. Later 3 per cent of alfalfa meal was added to keep the pigs alive in this lot. The addition of ground limestone caused some

improvement, but stiffness also developed. The further addition of bone meal to the ration gave the best results, both from the standpoint of the rate of gain and the health of the pigs. Bone black and treble superphosphate were slightly inferior to bone meal. Very little benefit followed the addition of acid phosphate or ground rock phosphate. Ashes apparently added nothing of importance to the combination of salt, limestone, and bone meal.

In another experiment salt and limestone; salt, limestone, and acid phosphate; and salt, limestone, and bone meal were compared as supplements to corn and ground soy beans. The daily gains made averaged 1.18, 1.26, and 1.3 lbs. with the respective mineral supplements. There were a few pigs in both lots not receiving bone meal which were slightly crampy at the close of the trial.

Other experiments indicated the beneficial effect of salt or salt and limestone when fed with ground soy beans and corn to pigs having access to rape pasture.

Cost of producing pork, J. A. McClary (*Canada Expt. Farms, Lennoxville (Que.) Sta. Rpt. Supt. 1923, p. 14*).—Three lots of approximately 43-lb. pigs were selected for comparing the following rations in 115- to 120-day feeding periods: Corn meal 75 lbs., bran 15, and middlings 10; corn meal 50 lbs., ground oats 25, and middlings 25; and screenings 80 lbs., ground oats 10, and bran 10 lbs. The lot receiving the heavy corn ration made an average daily gain of 1.32 lbs., as compared with 1.27 lbs. for the pigs receiving the light corn ration and 1.46 lbs. for those on the screenings ration. Due to the higher cost of the screenings ration, less profits were calculated to have resulted from it than from the corn rations.

[Poultry experiments at the Nappan Experimental Farm], W. W. Baird (*Canada Expt. Farms, Nappan (N. S.) Farm Rpt. Supt. 1923, pp. 47, 48, 49*).—Results of the following experiments with poultry are briefly reported:

Beef scrap v. skim milk.—In this experiment beef scrap, fed in the dry mash and separately supplied in self-feeders, was furnished to one lot of 10 birds, while another lot of similar size received the same feed except that beef scrap and blood meal were replaced by skim milk, which was supplied instead of water. From the results it is calculated that $1.64 per 100 lbs. would be realized for skim milk marketed in this way. Due to the lack of water, the birds consumed a large amount of milk, which materially increased the cost of feed.

Early v. late hatched pullets for winter production.—The average monthly production of pullets during the winter has been reported for birds hatched April 15 and May 28. The former group laid an average of 31.6 eggs per bird during the four winter months, as compared with 17.2 eggs for the latter group. Due to the high cost of eggs at this time, the profits over feed cost were estimated at 53.9 cts. per bird from the early hatched pullets, as compared with 9.8 cts. for the late hatched pullets.

[Experiments with poultry at the Lennoxville Experimental Station], J. A. McClary (*Canada Expt. Farms, Lennoxville (Que.) Sta. Rpt. Supt. 1923, pp. 47–49*).—The results of two experiments are briefly reported:

Early v. late hatched pullets.—The production during the four winter months of 1922–23 is given for pullets hatched during the first two weeks of April and compared with others hatched during the first two weeks of May. The results of this experiment, as well as a similar one conducted during three preceding years, have invariably shown a greater production for the early hatched birds, with correspondingly greater profits.

Commercial feed v. home mixed.—One lot of 50 birds fed a commercial scratch feed and a commercial mixed mash produced 2,148 eggs during the four

winter months, as compared with a production of 2,450 eggs laid by a similar lot fed a home mixed scratch feed consisting of 1 part cracked corn, 1 part wheat, and ½ part oats and a home mixed mash consisting of equal parts of bran, middlings, and corn meal, with 12 per cent of beef meal added.

Effect of a calcium carbonate supplement in the diet of hens, on the weight, protein content, and calcium content of the white and yolk of their eggs, G. D. BUCKNER, J. H. MARTIN, and A. M. PETER (*Amer. Jour. Physiol., 72 (1925), No. 3, pp. 458–463*).—Alternate eggs produced by hens in experiments at the Kentucky Experiment Station, dealing with the effect of calcium supplements on the hatchability of eggs and previously noted (E. S. R., 53, p. 577), were weighed and the weights of the contents and the yolks of the eggs determined. The amount of the white was calculated by difference. Analyses for nitrogen and calcium oxide were also made from composite samples of the whites and the yolks from the three lots. The results are tabulated for each month and by 3-months periods from November, 1923, to July, 1924.

The increase in weight of the contents of the egg, due to the feeding of a calcium supplement, was found to be nearly equally divided between the yolk and the white. A lack of the calcium supplement caused a large reduction in the number of eggs laid by confined birds. Though no reduction in the number of eggs followed the removal of the calcium supplement from the diet of birds having free range, the weights of the egg contents decreased about 10 per cent. The average percentage of protein and calcium oxide in the contents of the eggs did not seem to be affected by the calcium supplement.

Comparative analyses of the droppings of laying hens, with and without a calcium carbonate supplement in the diet, G. D. BUCKNER, J. H. MARTIN, and A. M. PETER (*Poultry Sci., 4 (1925), No. 5, pp. 165–170*).—In continuing the studies of calcium metabolism in hens at the Kentucky Experiment Station (E. S. R., 52, p. 75), the content of calcium oxide in the droppings of three lots of White Leghorns has been determined. Lot 1 was allowed the freedom of a grass range, while lots 2 and 3 were kept confined. Lots 1 and 2 received oyster shells ad libitum during February, March, and April, while no oyster shells were supplied during May, June, and July. Lot 3 received oyster shells during the second 3-months period but no oyster shells during the first 3 months. On the last day of each month the droppings of each lot were sampled and analyzed for ash, calcium oxide, and the solubility of the ash and calcium in hydrochloric acid, the averages of which are given below:

Average analyses of droppings

Lot	Oyster-shell supplement	Ash in dried droppings	CaO in ash	Ash insoluble in HCl	CaO in dried droppings	Insoluble matter in dried droppings
		Per cent	*Per cent*	*Per cent*	*Per cent*	*Per cent*
1	Given	21.8	25.7	36.5	5.4	8.3
	None	39.6	5.4	67.1	2.1	26.6
2	Given	17.4	28.6	16.9	5.0	2.9
	None	12.1	4.6	19.7	0.6	2.5
3	None	12.8	4.4	30.8	0.6	3.8
	Given	18.8	33.2	9.2	6.2	1.7

It is pointed out that the ash in the droppings indicated a larger consumption of soil and inorganic matter by the birds on the range when no oyster shells were being furnished. The calcium oxide percentage of the ash showed a distinct reduction in all lots not receiving oyster shells. The droppings were firmer when the birds received oyster shells, and treatment of the

ash under these conditions with hydrochloric acid resulted in a marked effervescence of carbon dioxide, but little or no carbonates were present in the feces of birds not receiving oyster shells, especially in the confined pens, indicating that all the calcium carbonate was being utilized for eggshell formation. Complete analyses of the minerals in the ash collected in July showed that the greater part of the calcium in the feces of birds not receiving oyster shells was present not as carbonate but as phosphate, which is not available for eggshell formation. Various differences in the color and physical properties of the feces and ash of the different lots are described.

Fattening farm poultry, E. W. HENDERSON (*Missouri Sta. Circ. 138 (1925), pp. 4, figs. 2*).—Directions for the feeding of crate-fattened poultry, including crate construction.

The variation of certain blood constituents of chickens during the molting season, T. J. THOMPSON and H. H. POWERS (*Poultry Sci., 4 (1925), No. 5, pp. 186–188*).—Analyses of 10-cc. samples of blood drawn from the wing veins of 12 mature Rhode Island Red hens prior to, during, and following molting at the Nebraska Experiment Station showed that during the molting season there were large variations in the nonprotein nitrogen, creatinine, and uric acid contents of the blood. The nonprotein nitrogen and creatinine generally increased during molting. This and other investigations have indicated that a serious disturbance in the chicken's metabolism occurs with molting. The blood analyses are tabulated for each sample taken from each hen.

Needed investigations of the factors affecting egg quality, R. R. SLOCUM (*Poultry Sci., 4 (1925), No. 5, pp. 179–183*).—A discussion of the factors determining quality in eggs, with special reference to the need of investigations as to what influences these factors.

DAIRY FARMING—DAIRYING

Mineral metabolism studies with dairy cattle.—Mineral equilibrium after prolonged lactation, H. G. MILLER, W. W. YATES, R. C. JONES, and P. M. BRANDT (*Amer. Jour. Physiol., 72 (1925), No. 3, pp. 647–654*).—In continuing this study from the Oregon Experiment Station (E. S. R., 51, p. 675), the mineral balances were determined on the same 3 animals after 10 months of lactation, all cows being farrow. They were producing approximately 20 lbs. of milk daily per head. The rations consisted of 15 lbs. of clover hay, 30 lbs. of oats and vetch silage, and 1 lb. of grain (corn 58, mill-run 32, and oil meal 10) per head daily. During the fourth, fifth, sixth and seventh weeks of the experiment 2 cows were given supplements of 150 gm. of bone meal daily, while the third cow received 20 lbs. of green kale during the first 18 days of the period. The mineral balances as calculated are tabulated below:

Mineral balances of nonpregnant cows late in lactation

Cow	Supplement to basal ration	Average daily milk yield	In 100 cc. blood plasma		Average daily balance							
			Calcium	Phosphorus	Nitrogen	Sulfur	Phosphorus	Chlorine	Calcium	Magnesium	Potassium	Sodium
		Kg.	*Mg.*	*Mg.*	*Gm.*	*Gm.*	*Gm.*	*Gm.*	*Gm.*	*Gm.*	*Gm.*	*Gm.*
216	None	9.25	8.63	4.00	+4.2	+1.7	+2.8	+5.2	+1.1	−3.2	−5.8	−0.6
	Bone meal	9.00	9.60	6.25	+1.7	+1.4	+7.3	+5.7	+14.5	−1.5	−6.3	−0.6
218	None	10.40	7.58	3.90	+1.4	+2.1	+3.0	+5.8	−3.2	−1.8	−12.2	−4.8
	Kale	11.92	9.97	4.25	+20.3	+2.1	+1.3	+5.8	+5.0	+0.7	+7.8	−0.6
222	None	9.84	8.09	3.75	+11.6	+2.5	+3.5	+5.5	+0.4	−0.1	−6.5	−0.4
	Bone meal	9.05	9.11	6.13	+19.2	+1.9	+6.6	+3.9	+10.0	+1.0	−5.0	+2.1

The results showed that the cows were substantially in equilibrium or storing all minerals except potassium, and that the supplements increased the amount of calcium and phosphorus stored and the amounts of these substances in the blood plasma. The supplements also caused the acid base equilibrium to change from a negative base to a positive base balance. Kale increased the milk production.

Experiments with dairy cattle [at the Huntley, Mont., Reclamation Project Experiment Farm], T. W. Moseley (*U. S. Dept. Agr., Dept. Circ. 330 (1924), pp. 21–26, fig. 1*).—The results of experiments with dairy cattle conducted during 1922 are briefly reported, many of which are continuations of those previously noted (E. S. R., 49, p. 875).

Pasturing experiments with dairy cows.—In the study of the effect of top-dressing irrigated grass pastures with barnyard manure, it was found that the top-dressed pasture carried the equivalent of 1 cow for 666 days, while the unmanured pasture supported the equivalent of 1 cow for 578 days. The combined results for 2 years indicate that the manuring increased the carrying capacity about 14 per cent. For studying the maximum carrying capacity of irrigated pastures 1 acre was seeded with a mixture of grasses in 1916 and top-dressed with manure at the rate of 12 loads per acre from 1917 to 1921, inclusive. The average carrying capacity of this pasture for 1922 was 2.13 cows per acre for 135 days, and for the 4-year average, 1919–1922, 2.04 for 138 days.

Methods of feeding dairy cattle.—A preliminary report of the results of a comparison of the economy of milk production by cows receiving rations of roughage only and roughage and grain are given. The roughages fed consisted of irrigated grass pasture and alfalfa hay in the summer and hay, corn silage, and some roots in the winter. The grain was fed at the rate of 1 lb. per 3 lbs. of milk produced. The average production of 7 cows which have completed full-year tests on the roughage and roughage and grain rations was 12,455 lbs. of milk and 454 lbs. of fat on the roughage ration and 16,366 lbs. of milk and 559 lbs. of fat on the roughage and grain ration. The cows fed roughage only lost weight during the first few months of the experiment, but later gained sufficient to make their average final weight similar to their initial weight. Those fed roughage and grain gained in weight.

[Experiments with dairy cattle at the South Dakota Station], T. M. Olson (*South Dakota Sta. Rpt. 1924, pp. 17, 18*).—Tests of self-feeding calves and the bacterial flora of cows' udders are briefly noted.

Relative value of whole milk and skim milk for calves when supplemented with a free choice of six feeds in self-feeders and alfalfa hay ad libitum.—In conducting this experiment 5 calves were allowed access to whole yellow corn, white corn, ground oats, bran, oil meal, and whole oats in separate compartments of a self-feeder. The results of this test indicated that the self-feeding of calves was not practical or economical. Too much high-priced protein feed was eaten, and the calves showed poor development in capacity from the consumption of too small an amount or roughage. They were also maintained in too fat a condition for economical growth. Two calves developed very crooked front legs, and one was unable to stand at the end of the experiment.

Bacterial flora of normal cows' udders.—Preliminary studies have indicated that individual animals vary widely in respect to the number of organisms contained in the milk. Normal udders varied from a sterile condition to as many as 225,000 per cubic centimeter. Many types of bacteria have been isolated which vary considerably in their effect on the milk.

Soy bean oilmeal and ground soy beans as protein supplements in dairy rations, L. H. Fairchild and J. W. Wilbur (*Jour. Dairy Sci., 8 (1925), No. 3, pp. 238–245*).—Essentially noted (E. S. R., 53, p. 175).

Feeding experiments with green pressed feed [trans. title], H. NIKLAS, K. SCHARRER, and A. STROBEL (*Landw. Jahrb., 61 (1925), No. 3, pp. 321–351, figs. 7*).—For studying the palatability and effect of green pressed feed as compared with hay on the health and milk production of dairy cows, two lots of 7 cows each were selected and fed during three periods. The animals in both lots received a basal ration of 1.5 kg. of wheat bran and 1 kg. of ground beans per head daily. During a preliminary period of 12 days both lots received 12 kg. of hay and aftermath and 2.5 kg. of green pressed feed, and the comparative milk production of the two lots was thus determined on the same ration.

During the rest of the experiment consisting of three periods, lot A received 12 kg. of hay and aftermath per head daily in addition to the basal ration. The ration of lot B was the same as that of lot A except that part of the hay and aftermath was replaced by sufficient pressed green feed or fermented green feed to supply an equal amount of dry matter. The supplements to the basal ration for lot B were thus during periods 1 and 2 8.4 and 4.8 kg., respectively, of hay and aftermath and 15.5 and 31 kg., respectively, of the pressed green feed. During period 3 the pressed green feed was replaced by an equal amount of fermented green feed. The periods were divided into two portions consisting of 6 and 10 days in periods 1 and 2 and 5 and 7 days in period 3.

The milk production and live weights of the animals during the preliminary feeding period showed that the two groups were comparable, with group B having an average daily milk production 0.21 kg. greater than group A. The results showed that the initial feeding of the pressed green feed in period 1 and the fermented feed in period 3 tended to stimulate the milk production of lot B for a short period, but as the feeds were continued the production dropped back even a little under that of lot A. The milk production of the two lots during period 2 was comparable to that in the preliminary feeding period. Green pressed feed and fermented feed had practically no permanent effect on milk production. Lot A gained an average of 8 kg. in live weight during the entire experiment as compared with a loss of 4 kg. by lot B.

The composition of the feeds used is tabulated in detail.

The influence of green pressed feed on the quality of the milk of dairy cows [trans. title], A. FEHR, K. ZEILER, and F. KIEFERLE (*Landw. Jahrb., 61 (1925), No. 3, pp. 353–362, fig. 1*).—Samples of the milk produced by the cows in the above experiment were studied as to the changes in flavor, chemical properties, or use for butter and cheese making during the different periods of the experiment.

The results showed that no biochemical changes occured in the milk with the silage feeding, but considerable care was necessary to keep it from acquiring a flavor. The butter produced from the milk of the cows receiving green pressed feed was somewhat like that of butter produced from the milk of cows on green grass. The chemical composition of the butterfat was favorably influenced by the feeding as shown by the Reichert-Meissl and iodine numbers. The milk was also found to be satisfactory for cheese making.

The control of dairy cattle in the different countries [trans. title], H. MÜNZBERG (*Ber. Landw. Reichsmin. Ernähr. u. Landw. [Germany], n. ser., 2 (1925), No. 3, pp. 478–501*).—This consists of descriptions of the methods employed in the different countries of the world for keeping and supervising milk production records.

The animal photograph in the service of Brown Swiss cattle breeding [trans. title], W. GSELL (*Ann. Agr. Suisse, 26 (1925), pp. 155–194, figs. 33; also in Landw. Jahrb. Schweiz, 39 (1925), No. 2, pp. 159–196, figs. 33*).—The author discusses the principles of animal photography and points out common faults

of animal pictures. Many illustrations of Brown Swiss cattle photographed correctly and incorrectly are given.

On the presence of supernumerary mammary glands in cows and on their functional activity, K. J. J. MACKENZIE and F. H. A. MARSHALL (*Jour. Agr. Sci. [England], 15 (1925), No. 1, pp. 30–35*).—An investigation of the numbers of cows possessing supernumerary teats in the Cambridge University herd and in several private herds showed that from 1 to 3 extra teats were present in over 50 per cent of the animals examined. Palpitation and dissection of three such udders showed that glands were associated with the teats. Tests by the phenylhydrazine method of the lactose content of the urine of such animals were positive in most cases when the cows were actively secreting milk. This indicates that milk was being produced by the supernumary glands and being resorbed into the blood. Thus milk was being formed which was not utilized.

Preliminary investigations in the bacteriology of milk, J. H. WALTON (*Agr. Research Inst., Pusa, Bul. 159 (1925), pp. [2]+14, pls. 2*).—An investigation of the bacterial content of the milk supply of Pusa, in which it is shown that milk of a low count may be produced provided proper care in cleaning and sterilizing milk utensils and in cleaning the cows is exercised. Cover topped milk pails and proper cooling are also deemed essential.

A systematic investigation of the value of the Frost little plate method of determining the number of living bacteria in milk, A. CLARENBURG (*Een Systematisch Onderzoek naar de Waarde der Kleine-Plaatculturen Volgens Frost voor de Bepaling van het Aantal Levende Bacteriën in Melk. Proefsch., Veeartsenijk. Hoogesch., Utrecht, 1925, pp. [4]+138, pls. 7*).—An investigation of the Frost little plate method for determining the bacterial content of milk proved this method to be very dependable. The best results were obtained when the samples were incubated for from 20 to 24 hours at approximately 28° C. This method proved superior to the use of gelatin plate cultures.

A comparison of the methylene blue reductase test and the direct microscopic count in grading milk at milk plants, H. C. TROY (*Jour. Dairy Sci., 8 (1925), No. 3, pp. 282–285*).—The author has made comparative tests by the methylene blue reductase method and by direct microscopic counts of the grade of 1,947 samples of milk collected at several milk plants.

Grade A milk required more than three hours for reduction in the methylene blue test and contained less than 300,000 sources per cubic centimeter, a source being considered as a single bacterium or a small group of bacteria. Grade B milk required from two to three hours for reduction in the methylene blue test and contained from 300,000 to 1,500,000 sources of bacteria. Samples requiring less than two hours for reduction or containing more than 1,500,000 sources of bacteria per cubic centimeter were classed as grade C milk. The author found that the microscopic count placed more samples in lower grades than the reductase test, but the two methods agreed in 86.2 per cent of the cases.

The dairy, creamery, and cheese factory, G. DERVAUX (*La Laiterie et la Beurrerie; la Fromagerie. Paris: Garnier Bros., 1924, pp. VII+221, figs. 122*).—A textbook on the handling of milk in the dairy, including pasteurization, bottling, etc., and the manufacture of butter and cheese, with special reference to the machinery and utensils employed.

[Experiments in dairying at the South Dakota Station], T. M. OLSON (*South Dakota Sta. Rpt. 1924, pp. 19, 20*).—The results of two studies are briefly noted.

[*The effect of frozen cream on the quality of butter.*]—Butter made from frozen cream showed a decided short grain immediately after the working was completed, but there was no apparent difference in the time required for churning or in the curd content of butter made from frozen cream as compared with that made from normal cream. The frozen cream itself after thawing developed a curdiness or flakiness resembling sour cream in appearance.

Effect of methods of washing separators on the bacterial content of cream and skim milk.—When the separators were only rinsed after use the average bacterial count of the cream from the following separation was 10,800,000 per cubic centimeter. When the separators were washed and scalded the count was 5,500,000. The skim milk showed even greater differences than the cream. The keeping quality of the cream was considerably improved when the separator was washed after each separation.

Effect of ingredients in the ice cream mix on its freezing point, E. H. Parfitt and C. L. Taylor (*Jour. Dairy Sci., 8 (1925), No. 3, pp. 230–237*).—The effect of the different ingredients in the ice cream mix on its freezing point was investigated in studies at the Indiana Experiment Station. The mixes were frozen in a Hortvet cryoscope, and the freezing point was determined as the temperature at which the thermometer remained constant.

The results showed that increases in the fat content from 8.3 to 17.6 per cent, aging up to four weeks, and increases in the gelatin (heated to destroy jellying strength) content from 0.5 to 4.1 per cent had no effect on the freezing point. Increases from 5.6 to 15 per cent in the casein lowered the freezing point from −2.1 to −2.9° C. The freezing point was lowered from −2.0 to −3.6° by increasing the sucrose content from 12 to 19.2 per cent. Increasing the lactose content from 6.2 to 15.6 per cent resulted in lowering the freezing point from −2 to −3.2°, while the development of lactic acid from 2.3 to 8.5 per cent resulted in a reduction in the temperature at freezing point from −1.8 to −2.4°. Partial neutralization of the lactic acid from 3.4 to 2.0 per cent by the use of sodium bicarbonate resulted in the lowering of the freezing point from −2.4 to −2.9°.

A bacteriological study of the homogenizing process in making ice cream, F. W. Fabian (*Jour. Dairy Sci., 8 (1925), No. 3, pp. 246–269*).—A study of the effect of homogenization on the bacterial content of the ice cream mix is reported from the Michigan Experiment Station.

Plate counts of 25 mixes prior to and after pasteurization showed that increases occurred in all but one of the mixes. Direct microscopic counts of the same mixes not only showed increases in the numbers of groups of bacteria after homogenization, but in 80 per cent of the mixes there was an increase in the numbers of individual bacteria. Homogenization, however, did tend to reduce the size of the groups. Similar studies on 5 samples of milk passed through the homogenizer, first without pressure and then with 1,000 lbs., 1,500 lbs., 2,000 lbs., and 2,500 lbs. pressure, showed that homogenization not only tended to break up the clumps but also added to the total number of bacteria present, as it did with the ice cream mixes. Water run through the homogenizer also showed the presence of variable numbers of bacteria.

The types of organisms found in the water rinsed through the homogenizer and in the mixes before and after homogenization were determined by the use of milk powder agar. The total numbers were determined by the plate count and classified as follows: Those showing a cloudy zone or slight hazy edge were grouped as strong acid-forming colonies, those forming acid but without a cloudy zone were considered as weak acid-forming colonies,

those clearing when the plate was flooded with a 5 per cent solution of acetic acid were grouped as peptonizers, while the balance were considered as alkali formers and inert colonies. The plates of the rinse water showed that 34 per cent of the colonies were alkaline and inert, 33 per cent were weak acid producers, and 30 per cent were peptonizers. The average of the mixes before pasteurization showed 43 per cent alkaline and inert colonies, 35 per cent weak acid, and 17 per cent peptonizing colonies. After homogenization the plates showed 36 per cent each alkaline and inert colonies and weak acid colonies, and 22 per cent peptonizers.

A statistical study of the types of bacteria found in 25 mixes before and after pasteurization did not reveal differences in types which could be considered significant, indicating that the bacterial contamination of the homogenizer is of the same type as is normally found in milk.

VETERINARY MEDICINE

Ultraviolet light in veterinary medicine, E. J. Frick and J. F. Bullard (*Jour. Amer. Vet. Med. Assoc., 67 (1925), No. 4, pp. 515–521, figs. 7*).—In this paper the authors call attention to the value of the actinic ray, commonly called ultraviolet light, in the treatment of animal diseases. Several cases are briefly reported.

Excerpts from literature on Bayer 205, H. Hartnack (*Jour. Amer. Vet. Med. Assoc., 67 (1925), No. 3, pp. 397–400*).—This is a brief review of some recent literature.

Studies of the corpus luteum, C. Elder (*Jour. Amer. Vet. Med. Assoc., 67 (1925), No. 3, pp. 349–363, figs. 7*).—This is a contribution from the Wyoming Experiment Station.

Annual report for 1924 of the principal of the Royal Veterinary College, J. McFadyean (*Jour. Roy. Agr. Soc. England, 85 (1924), pp. 415–425*).—This report includes accounts of the occurrence of anthrax, glanders, sheep scab, hog cholera, parasitic mange in horses, swine erysipelas, fatty liver as a cause of death in lambing ewes, and foot-and-mouth disease. An experiment conducted indicates that chickweed (*Stellaria media*) is not poisonous to lambs.

Report of the veterinary pathologist, division of veterinary research, J. Walker (*Kenya Colony Dept. Agr. Ann. Rpt. 1921, pp. 54–110*).—Experiments with wart hogs have shown that they harbor the virus of hog cholera in the blood but are not highly susceptible to the disease. The details of immunity work with pleuropneumonia contagiosa, tuberculin tests in cattle, experiments in the production of anaplasmosis or genuine gall-sickness, redwater-gall sickness vaccine, the occurrence of colon bacillosis and infectious bovine and equine abortion, and work with trypanosomiasis, Kikuyu fowl disease, rinderpest, pseudorabies, and wasting sickness are presented.

Report of the acting Government veterinary surgeon for 1924, M. Crawford (*Ceylon Govt. Vet. Surg. Rpt. 1924, pp. 10*).—This includes an account of the infectious diseases of livestock in Ceylon.

[Diseases of livestock in India] (*India [Dept. Agr.] Rev. Agr. Oper., 1923–24, pp. 85–94*).—Brief accounts are given of the prevention and treatment of disease, incidence of disease, preventive inoculation, veterinary education, and veterinary research.

The helminth parasites of domestic animals and man in Indo-China, I, II [trans. title], A. Railliet (*Bul. Soc. Zool. France, 49 (1924), No. 8–10, pp. 589–608; 50 (1925), No. 1, pp. 7–26*).—A summary of information on these helminths, systematically arranged.

Experimental investigations of the life history of some trematodes [trans. title], P. Mathias (*Bul. Biol. France et Belg., 59 (1925), No. 1, pp.*

1–123, pls. 4, figs. 13).—These studies cover species representing the families Holostomidae, Echinostomidae, and Psilostomidae, namely, *Strigea tarda* Steens., *Hypoderaeum conoideum* Bloch, and *Psilotrema spiculigerum* Muhl.

Further cultural characteristics differentiating B. chauvoei from other anaerobes, A. S. Schlingman and A. W. Haines (*Jour. Bact., 10 (1925), No. 5, pp. 449–458*).—In order to further differentiate the organisms (E. S. R., 53, p. 181), comparisons were made of the growth of *Bacillus chauvoei, Vibrion septique*, and *B. edematis maligni*, using practically all the body tissues and fluids of the ox as a base for both solid and liquid media.

It was found that "*B. chauvoei* does not grow in 2 per cent agar medium containing 2 per cent glucose, but it does grow in this medium when it is enriched by approximately 20 per cent fresh filtered beef serum. Both the *V. septique* and *B. edematis maligni* are active in the glucose medium and the glucose serum medium. In amniotic medium containing no peptone or salt, *B. chauvoei* did not grow. The other two organisms grew in this medium, but their activity was lessened by the lack of the peptone and salt. Both the *V. septique* and *B. edematis maligni* grew in both the solid and liquid forms of the brain medium, while *B. chauvoei* grew only in the solid form.

"In litmus milk under oil, under paraffin, and in fermentation tubes, whether inoculated by loop or by pipette, no growth of *B. chauvoei* occurred. The *V. septique*, in this medium, produces acid and a soft clot, no digestion of the clot occurring even after 10 days' incubation. *B. edematis maligni* produces acid and a solid clot which is practically all digested after 10 days' or 11 days' incubation.

"In egg-meat medium, *B. chauvoei* grew as it does in Hibler medium, the only changes occurring being those of gas production with a slight indication of butyric acid. The *V. septique* grew in this medium with active gas production and a slight pinkening of the meat pieces. No digestion of either the meat pieces or albumin occurred. The growth of *B. edematis maligni* in this medium was characterized by gas production, darkening of the liquid, and, after about 5 days' incubation, a digestion of approximately all of the egg albumin. After 10 to 11 days' incubation, one-half to three-fourths of the meat pieces were digested."

The California and Texas foot-and-mouth disease outbreaks, J. R. Mohler (*Jour. Amer. Vet. Med. Assoc., 67 (1925), No. 1, pp. 84–90*).—This is an account of outbreaks of this disease in 1914 and the eradication work conducted.

Outlines of tuberculosis eradication, J. R. Mohler (*Vet. Med., 20 (1925), No. 10, pp. 447–453*).—This is a report of an address presented at the Eastern States Tuberculosis Conference, at Providence, R. I., in June.

Plants toxic to animals in Argentina [trans. title] (*Min. Agr. [Argentina], Secc. Propaganda e Informes Circ. 472 (1925), pp. 20, figs. 5*).—This is a report of general observations on plants experimented with at the botanical laboratory of the Ministry of Agriculture.

Poisoning of cattle by sweet clover hay, A. Broerman (*Jour. Amer. Vet. Med. Assoc., 67 (1925), No. 3, pp. 367–371*).—It is pointed out that the exact nature of the toxic substance in sweet clover hay which is the cause of this affection has not been established.

On the origin and significance of some pathological processes of the bovine uterus, E. T. Hallman (*Jour. Amer. Vet. Med. Assoc., 67 (1925), No. 3, pp. 324–337, figs. 13*).—This is a contribution from the Michigan Experiment Station, a reference to which has been noted (E. S. R., 52, p. 381).

Gas insufflation of the Fallopian tubes in valuable breeding cows, G. L. Moench (*North Amer. Vet., 6 (1925), No. 10, pp. 24–27, fig. 1*).—The author

finds that the Rubin test can be employed in animals as well as human beings to test the patency of the Fallopian tubes. The test is primarily of diagnostic importance, but a certain percentage of therapeutic results may be expected.

Further report on abortion in cattle without demonstrable cause, J. Traum and G. H. Hart (*Jour. Amer. Vet. Med. Assoc., 67 (1925), No. 3, pp. 372–375*).—This contribution from the California Experiment Station, in continuation of that previously noted (E. S. R., 49, p. 79), reports upon three cases that recently occurred in animals under observation on different premises. While in the aggregate such abortions are not of great economic importance to the livestock industry, unless properly diagnosed they become a source of serious annoyance where efforts to control infectious abortion are under way.

Bovine infectious abortion: Prevention and control, M. F. Barnes (*Jour. Amer. Vet. Med. Assoc., 67 (1925), No. 1, pp. 54–74*).—Results obtained by the Pennsylvania Bureau of Animal Industry in a herd maintained at an average of approximately 100 animals of producing age indicate that the suppression of abortion by elimination of reactors is a slow but worth-while process. It is pointed out that it can not be positively determined that the disease is eradicated until results of blood tests have been negative for a period of possibly one year. "All cows in the herd should have given birth to calves and should have passed the blood test subsequent to calving, that is, the entire herd should have been negative over sufficient period to give all cows in the herd time to calve. After such period, the herd might be considered free. Pregnant cows, even though sufficiently infected to cause abortion, will not all react unless they are such pregnant cows as reacted previous to pregnancy."

The bacterial content of milk or inflammatory exudates from bovine mastitis, C. M. Carpenter (*Jour. Amer. Vet. Med. Assoc., 67 (1925), No. 3, pp. 317–323*).—Bacteriological examinations made on 150 samples of abnormal milk and inflammatory exudates from infected udders gave the following results: Alpha hemolytic streptococcus 118, beta hemolytic streptococcus 10, *Bacillus pyogenes* 6, *Staphylococcus aureus* 6, *S. albus* 3, unidentified Gram-negative rod 2, colon bacilli 3, mixed—alpha hemolytic streptococcus and *S. aureus* 1, and negative 1. These samples, collected from 76 herds in New York, Massachusetts, and Pennsylvania, show 78.6 per cent to be infected with the alpha hemolytic streptococcus.

The use of living suspensions of alpha hemolytic streptococci in the control of bovine mastitis, C. M. Carpenter (*Jour. Amer. Vet. Med. Assoc., 67 (1925), No. 3, pp. 304–316*).—Work conducted at the New York State Veterinary College, here reported upon, indicates that the injection of living suspensions of alpha hemolytic streptococci affords a cow some protection from mastitis. Many unknown factors, however, have to be considered. It is pointed out that of the 12 cases of mastitis which developed in the 123 treated animals, nearly all occurred in the first or second month following the injections of the streptococci. Of 40 cases, in two herds, treated with autogenous suspensions only 6, or 15 per cent, failed to make complete recovery. Of the animals which suffered from mastitis and which had never been injected with the living cultures, 57.1 per cent in one herd and 84.4 per cent in the other failed to recover.

Losses among sheep in Idaho associated with the presence of liver flukes, W. T. Huffman and J. S. Dade (*Jour. Amer. Vet. Med. Assoc., 67 (1925), No. 4, pp. 529–531*).—Three years' investigations, in several sections of Idaho, of losses among sheep pastured during the early fall in mountain valleys have led to the conclusion that the losses are due to liver fluke disease

and auto-intoxication from fermentation of paunch contents, brought on by impaired digestion resulting from frozen green forage.

A fatal disease of feeder lambs, B. A. BEACH (*Jour. Amer. Vet. Med. Assoc., 67 (1925), No. 5, pp. 632–635*).—In this contribution, from the Wisconsin Experiment Station, the author reports upon investigations of a fatal disease in two flocks of lambs on farms several miles apart and on dissimilar rations.

Most of the affected lambs died without showing noticeable symptoms. Post-mortem lesions were septicemic in nature with a marked involvement of the musculature. Bacteriological examination of specimens from three different lambs revealed a pathogenic anaerobe, *Clostridium oedematis maligni* (*Vibrion septique*). Animal inoculation proved this organism pathogenic for lambs and guinea pigs, but rabbits were very resistant. A filtrate made from a culture of this organism was successful in preventing the disease in guinea pigs. This filtrate also gave satisfactory results as an immunizing product for lambs, although the author does not consider the field results to be conclusive.

Joint ill in lambs, R. L. CORNELL and R. E. GLOVER (*Vet. Rec., 5 (1925), No. 39, pp. 833–839*).—This is a report of an investigation, made during the lambing season of 1925, of the various organisms that are capable of setting up this disease in lambs under natural circumstances. The authors find that extensive outbreaks of a polyarthritis are not infrequently due to a streptococcus unaccompanied by any other organism. In some outbreaks all indications point to the umbilicus as being the point of entry of the causal organism, but in one outbreak the possibility of intrauterine infection could not be excluded. While the bacillus of swine erysipelas proved to be the cause of one outbreak, it is considered probable that this will be found to be only an occasional factor in the etiology of this condition.

Horse parasites collected in the Philippine Islands, B. SCHWARTZ and E. B. CRAM (*Philippine Jour. Sci., 27 (1925), No. 4, pp. 495–505, pls. 3*).—This is a list of parasites collected from some 15 native horses autopsied at Los Banos from January, 1921, to March, 1923. All but 4 of the 26 species are recorded for the first time as parasites of Philippine horses. Of the 26, 3 occur in the stomach, 2 in the small intestine, 20 in the large intestine, and 1, *Setaria equina*, in both the small intestine and abdominal cavity.

The leucocytes of the blood of dogs [trans. title], J. VERGE (*Rec. Méd. Vét., 101 (1925), No. 16, pp. 522–527*).—In the course of investigations of tuberculosis of the dog, the author made a comparison of the leucocyte content of the blood of normal dogs with that of dogs suffering from acute tuberculosis. Many of the data are presented in tabular form.

The effect of cod liver oil on dogs convalescing from distemper, A. S. SCHLINGMAN (*Jour. Amer. Vet. Med. Assoc., 67 (1925), No. 1, pp. 91–96*).—The results obtained from the administration of relatively large doses of cod liver oil to dogs suffering from distemper are considered to indicate that, while it is not specific, it is of great benefit in shortening the period of convalescence, and can be recommended as a valuable adjunct to the treatment of this disease. *Bacillus bronchisepticus* was isolated from the bronchi of eight and from the nasal discharges of but two of the nine dogs from which cultures were made. Two of these dogs were found to harbor *B. bronchisepticus* for at least three weeks after apparent recovery had taken place, and these animals should be regarded as being carriers of the organism and possible spreaders of the disease.

The effect of carbon tetrachlorid on puppies, A. S. SCHLINGMAN (*Jour. Amer. Vet. Med. Assoc., 67 (1925), No. 4, pp. 474–479*).—The author finds that pups three months of age tolerate doses of carbon tetrachloride which are considerably in excess of the recommended 0.3 cc. per kilogram of body weight.

Physiology of blood pressure in the domestic fowl, B. F. KAUPP (*Poultry Sci., 3 (1924), No. 3, pp. 96–100*).—This is a contribution from the North Carolina Experiment Station.

The average blood pressure of the femoral artery of 4 cocks under anesthetic was found to be 104 mm., and the average blood pressure of 2 bronze turkeys, 1 cockerel, and 1 hen under anesthetic to be 122 mm. The average blood pressure of 13 cocks observed in 1921 and 1922 when only local anesthetic was used was 135 mm. An earlier account by the author has been noted (E. S. R., 50, p. 82).

[**Affections of poultry**], S. ERIKSEN (*Avian Path. [Missouri Poultry Sta.], 1 (1923), Nos. 1, pp. 1–3; 2, pp. 4–6; 1 (1924), Nos. 3, pp. 7–9; 4, pp. 10–12; 5, pp. 13–15; 6, pp. 16–18; 7, pp. 19–21; 8, pp. 22–24; 9, pp. 25–27; 10, pp. 28–30; 11, pp. 31–34; 2 (1924), Nos. 1, pp. 1, 2; 2, pp. 3–5; 2 (1925), Nos. 3, pp. 6–8; 4, pp. 9–11; 5, pp. 12–14; 6, pp. 15–17; 7, pp. 18–20, fig. 1; 8, pp. 21–23; 9, pp. 24–26*).—Accounts presented in volume 1 relate to the Anatomy and Physiology of the Fowl (pp. 2, 3), Diagnosis of Poultry Diseases (pp. 4–6), Common Infectious Diseases of Fowls (pp. 7–12), Abstracts and Extracts from Recent Literature Regarding Poultry (pp. 13–15), Infectious Diseases Characterized by a Chronic Course (pp. 16–18), Nutritional Deficiencies and Their Relation to Poultry Diseases (pp. 19–24), Internal Parasites of Poultry (pp. 25–30), and External Parasites of Poultry (pp. 31–33).

Accounts presented in volume 2 relate to Poultry Hygiene (pp. 1, 2), Poultry Sanitation (pp. 3–5), The Epizootic of Bronchitis among Chickens (pp. 6–8), Diseases of Chicks (pp. 9–17), Blackhead in Turkeys (pp. 18–20), Coccidiosis in Fowls (pp. 21, 22), Bacillary White Diarrhea Eradication Demonstration (p. 23), and Avian Surgery (pp. 24–26).

The effects of lactic acid on B. pullorum, B. avisepticus, and B. sanguinarium, and its possible rôle in the control of intestinal diseases of poultry, B. F. KAUPP and R. S. DEARSTYNE (*Poultry Sci., 4 (1925), No. 6, pp. 242–249*).—After reviewing the literature on lactic acid in its relation to digestion, the authors report upon experiments conducted with a view to determining the influence of various strengths upon *Bacillus avisepticus*, *Bacterium pullorum*, and *B. sanguinarium*. It is pointed out that the study has a practical bearing, particularly since the lactic acid is not destroyed in the preparation of either condensed or dried buttermilk.

In the experiment Erlenmeyer flasks containing 300 cc. of sterilized milk were used. After titration, 5 of the 24 flasks were selected for each organism, to which pure lactic acid was added to reach from 0.33 (approximately that of raw milk) to 0.83 per cent (as much or more than occurs in palatable buttermilk). The flasks were then inoculated with cultures of *B. sanguinarium*, *B. pullorum*, and *B. avisepticus* and incubated. The rate of increase or decrease which took place during the three following days in the cultures in each of the 15 tubes is reported upon, the details being presented in tabular form.

It was found that the limit of tolerance to lactic acid of both *B. sanguinarium* and *B. pullorum* is between 0.6 and 0.7 per cent, and of *B. avisepticus* between 0.5 and 0.6 per cent.

Blackhead in chicks, S. ERIKSEN (*Poultry Sci., 4 (1925), No. 6, pp. 250–255*).—Investigations of blackhead in chicks at the Missouri Poultry Experiment Station, where the disease has been quite prevalent during the past two years, are reported upon. The symptoms and lesions were found to be identical to blackhead in turkeys, but the losses are usually less severe, varying from one or two individuals in a flock to over 50 per cent. Attempts at artificial transmission failed in 43 cases. General methods of sanitation and water medication are recommended in controlling the disease.

Induced and natural transmission of blackhead in the absence of Heterakis, E. E. TYZZER and J. COLLIER (*Jour. Infect. Diseases, 37 (1925), No. 3, pp. 265–276*).—This is a report of investigations conducted in continuation of those previously noted (E. S. R., 45, p. 484; 46, p. 485). The experiments were planned with a view to determining whether it is possible for the disease to be transmitted by direct exposure of normal to infected turkeys in the absence of *Heterakis papillosa*, it having been shown by Graybill and Smith that the disease can be produced in turkeys by feeding the embryonated eggs of *H papillosa* (E. S. R., 43, p. 475).

No case of blackhead developed in the large numbers of incubator hatched turkeys kept in clean compartments and fed on sterilized food, and turkeys reared under such conditions were found to remain free from intestinal amebas and flagellates for long periods. The authors consider the early appearance of coccidiosis under conditions of strict isolation to indicate that the coccidium of the turkey is transmitted either through the turkey's egg or on the shell of the latter. Blackhead of the type which occurs naturally may result from feeding material from active liver lesions, but is produced more regularly by the rectal injection of such material. The passage of the blackhead protozoan into the turkey's cecum in sufficient numbers for it to become established appears to be the only condition necessary for the invasion of the tissues in young turkeys, so that lowered resistance and local injury are without etiologic significance. It is apparent from the present experiments that the blackhead protozoan is discharged from acutely infected turkeys in a form which is capable of producing infection if ingested at once, but which persists for only a short time outside the body. The possibility of the direct transmission of the disease from infected to healthy stock indicates the importance of the isolation of the former.

Fowl typhoid and fowl cholera, B. F. KAUPP and R. S. DEARSTYNE (*North Carolina Sta. Tech. Bul. 27 (1925), pp. 4–83, figs. 33*).—The first and greater part of this bulletin (pp. 5–72, 80) deals with investigations of fowl typhoid, due to *Eberthella sanguinaria* (Moore). This disease is widely distributed in North Carolina, where it occurs during the late fall, winter, and early spring. An extended report of field studies during two outbreaks of the disease, including case reports of 33 individuals, and tabular data on mortality in fowl typhoid, the results of clinical studies of artificially infected birds, the recovery of *E. sanguinaria* from birds dying from fowl typhoid, body and visceral weights of birds succumbing to artificial infection with *E. sanguinaria*, the effect of fowl typhoid on body weight of adult birds under artificial infection conditions, and a composite table showing blood studies of birds infected with *E. sanguinaria* are presented, together with temperature and other charts.

The account of fowl cholera (pp. 73–79, 81) includes a tabulation of artificial infection with *Pasteurella avicida*. No outbreaks were recorded from the State during the period of the investigation.

A bibliography of 34 titles is included.

Observations on the classification of Salmonella [trans. title], J. LIGNIÈRES (*Rec. Méd. Vét., 101 (1925), No. 8, pp. 196–201; also in Bul. Acad. Méd. [Paris], 3. ser., 93 (1925), No. 18, pp. 500–505*).—A comparison made by the author of the organism causing avian typhoid in Argentina with *Bacterium sanguinarium*, the cause of fowl typhoid in France, has led to the conclusion that they are identical.

Common disinfectants and their use, F. R. BEAUDETTE (*New Jersey Stas. Hints to Poultrymen, 14 (1925), No. 1, pp. 4*).—This is a brief practical account of disinfectants available for use by poultrymen.

AGRICULTURAL ENGINEERING

Report of the agricultural engineer, Burma, for the year ending June 30, 1924, W. SMITH-ROLLO (*Burma Agr. Engin. Rpt., 1924, pp. 11, figs. 5*).—This report deals with work on the development of sugar refinery furnaces, improved plows and water lifts, and on irrigation, especially by pumping.

Surface water supply of Snake River basin, 1921 (*U. S. Geol. Survey, Water-Supply Paper 533* (*1925*), *pp. VI+292, pls. 2*).—This report, prepared in cooperation with the States of Idaho, Oregon, Nevada, and Washington, presents the results of measurements of flow made on streams of this basin during the year ended September 30, 1921.

Surface water supply of the lower Mississippi River basin, 1922 (*U. S. Geol. Survey, Water-Supply Paper 547* (*1925*), *pp. IV+106, pls. 2*).—This report, prepared in cooperation with the States of Missouri, Colorado, and Kansas, presents the results of measurements of flow made on streams of this basin during the year ended September 30, 1922.

Water power and flood control of Colorado River below Green River, Utah, E. C. LARUE (*U. S. Geol. Survey, Water-Supply Paper 556* (*1925*), *pp. X+176, pls. 79, fig. 1*).—The purpose of this report, which contains a foreword by H. Work and an introduction by N. C. Grover, is to present the facts regarding available water supply and all known dam sites on the Colorado River between Cataract Canyon, Utah, and Parker, Ariz., and to show the relative value of these dam sites. For the latter purpose a comprehensive plan of development for the Colorado River below the mouth of Green River is presented which will provide for the maximum practicable utilization of the potential power, maximum preservation of water for irrigation, effective elimination of the flood menace, and an adequate solution of the silt problem. This plan contemplates the construction of 13 dams, making available 3,383 ft. of head for the development of power and a maximum of 42,000,000 acre-ft. of storage capacity for the control of floods, equalization of flow, and storage of silt. Under the plan suggested and with the water supply estimated to be available in 1922, 4,350,000 continuous horsepower may be developed.

Effects of forest fires on land clearing and crop production, M. J. THOMPSON (*Minnesota Sta. Bul. 220* (*1925*), *pp. 3–23, figs. 12*).—Experiments are reported which showed that the forest fire of October 12, 1918, at the Northeast Experiment Station occasioned a saving of 40 per cent in man labor in brushing, 16 per cent in logging, and 40 per cent in skidding and miscellaneous work. However, the burning of brush required 46 per cent more time.

The fire seemed more effective than 4 years of decay in reducing stumping costs. Stumps that were dead, partially decayed, and burned were cleared at a saving of 35.7 per cent in man labor and 36.7 per cent in horse labor as compared with stumps that were green when burned.

Post-fire clearing of green stumps was done at a saving of 23.1 per cent in man labor and 21.2 per cent in horse labor. Post-fire clearing of ripe, dry stumps was done at a saving of 44.9 per cent in man labor. The principal saving in removing dry stumps as compared with green stumps was in explosive rather than in labor. Using 1914 price levels, post-fire clearing of all conditions of stumps was done at a saving of 55.17 per cent of pre-fire costs for both green and dry stumps.

Under very favorable conditions a light tractor showed a slight advantage over horses in speed of stumping, but both were about equal in completeness of work.

Studies in the physical properties of soils.—I, Mechanical properties concerned in cultivation, W. B. HAINES (*Jour. Agr. Sci.* [*England*], *15* (*1925*),

No. 2, pp. 178–200, figs. 8).—In a contribution from the Rothamsted Experimental Station, the mechanical properties of soils which are concerned in plowing are considered under the three headings of cohesion, plasticity, and surface friction between soil and metal. In each case methods of measurement are discussed, and experimental curves are given for representative soils over the whole moisture range with which the practical agriculturist is concerned. In the case of cohesion, Atterberg's method of measurement is followed. A new technique is described for measuring one of the plastic constants, which is specially adapted to clays, and throws fresh light on their physical characteristics. The measurements on soil friction are considered to open up a fresh subject, and promise to provide a sensitive means of investigating soil-water relationships from a new angle.

The cohesion studies showed that a general qualitative relationship apparently exists between the results of laboratory experiments on the cohesion of puddled soil and those of field measurements of cohesion. Laboratory tests of samples taken from certain plats on the same field which had shown marked differences in the dynamometer readings during plowing showed the same differences in the cohesion curves as were noted in the field. The values were comparable in a qualitative sense only, but the results are considered to mark a definite step toward a specification in exact terms of the field characteristics of different soils.

The results of preliminary experiments on surface friction between metal and a light sandy soil and a heavy loam as they were gradually dried showed that both soils gave a practically constant friction for a range of moisture content of from 0 to about 12 per cent. At this point the soils began to wet the metal, and an increase in friction resulted. This increase reached a maximum at about 17 per cent moisture content in the light sandy soil. Beyond that point the metal surface was wetted so freely as to be lubricated by the water film, and the friction decreased. This continued until the soil was too fluid to bear the weight of the metal slider.

The heavy soil showed two maxima in the friction instead of only one. These corresponded to two different manners in which such a soil may be said to wet a metal surface, namely, wetting without sticking and sticking. In the one case the water in the larger capillaries in the soil wets the metal surface, but the soil itself is firm and coherent, so that the metal slides without being contaminated by the soil to an appreciable extent. For this soil, shrinkage measurements showed that the soil pores were just full of water at about 19 per cent, so that the wetting began a litle before this stage was reached and extended considerably beyond it. Later, as in the case of the sandy soil, the wetting became so free as to produce a lubricating effect. The beginning of the second increase in the friction curve corresponded to the point at which the soil began to stick to the metal. This corresponded to a definite stage of water saturation of the clay in the soil, and true surface friction ceased at this stage, since the slippage took place no longer at the surface of contact but within the top layers of the soil itself. The governing factor was then the plasticity.

The moisture content of Rothamsted soil during plowing operations was usually about 20 per cent, which conditions did not approach the region of stickiness. On soils which were very heavy to plow, the moisture content was 28 per cent and the plowing draft was 40 per cent greater than on the immediately adjacent plat with 22 per cent moisture. These results are taken to indicate that over a moisture range suitable for plowing the cohesion increases when the friction decreases, and that the choice of an optimum

moisture from the point of view of the ease of plowing should consider two opposite effects.

No consideration is given similar work which has been reported on from time to time by certain American experiment stations.

Studies in soil cultivation, I–III, B. A. KEEN and W. B. HAINES (*Jour. Agr. Sci.* [*England*], *15* (*1925*), *No. 3, pp. 375–406, pls. 2, figs. 10*).—Three contributions to the subject from the Rothamsted Experimental Station are presented.

I. *The evolution of a reliable dynamometer technique for use in soil cultivation experiments.*—An account is given of a reliable technique that has been evolved for making dynamometer measurements in the field. It is shown that quite small variations in the trace of the drawbar pull are significant, and correspond to actual variations in the resistance of the soil. No significant change in drawbar pull is produced by imperfect adjustments in the hitch or set of the implement within the limits met with in ordinary plowing, except in so far as the depth of working is affected. The drawbar pull bears a linear relationship to plowing depth within the limits of ordinary plowing. The slope of the land is without appreciable effect on the drawbar pull up to gradients of 1 in 40.

A detailed study of the effect of changes in speed showed that, although the drawbar pull increases with speed, the percentage increase is relatively so slight that considerable saving in labor and other costs should result if the speed of plowing were increased. The ordinary expression for work done, the product of drawbar pull and distance, was found to be unsuitable as a measure of the power output, and pending direct determinations of fuel consumption, the so-called power factor, defined as the product of drawbar pull and the time taken to plow a unit of length, was employed.

The general conclusion is drawn that during a steady run with tractor and plow the variations in drawbar pull can be ascribed entirely to variations in soil texture or soil resistance, and that chance changes in the implemental factors will not produce large effects.

II. *A test of soil uniformity by means of dynamometer and plough.*—Measurements are recorded of the resistance of soil to plowing, taken with a view to testing the uniformity of a soil over a single field. The results indicate large variations over short distances, and the differences are presented by means of isodyne contours drawn on a map. The importance is emphasized of assuming and allowing for such variations before drawing conclusions from the drawbar pull recorded by different implements. Preliminary work is described, showing that the variations are correlated with clay content and also with the growth of a crop in its early stages.

III. *Measurements on the Rothamsted classical plots by means of dynamometer and plough.*—Maps showing the resistance of soil to plowing, drawn up from dynamometer readings taken over several seasons for the Rothamsted classical plats, carrying wheat, barley, and roots, are presented. The conclusions as to the effect of manurial treatment are of only a general nature, and such differences as are evident are small in comparison with the natural variations in the soil. In the case of the Broadbalk wheat plats the drawbar pull values had a close relationship with the clay content of the soil and with certain aspects of the soil drainage.

Public Roads, [October, 1925] (*U. S. Dept. Agr., Public Roads, 6* (*1925*), *No. 8, pp. 165–184+*[*2*], *figs. 17*).—This number of this periodical contains the status of Federal-aid highway construction as of September 30, 1925, together with the following articles: The Six-Wheel Truck and the Pavement, by L. W. Teller (see p. 180); Railroad Abandonments and Their Relation to High-

way Transportation, by H. R. Trumbower; The Action of Sulphate Water on Concrete, by D. G. Miller (see below); Clay Soils in Relation to Road Subgrades, by H. H. Bennett; Highway Research Board Activities; and The Preparation of Concrete Cores for Compression Tests, by C. E. Proudley.

The six-wheel truck and the pavement, L. W. Teller (*U. S. Dept. Agr., Public Roads, 6 (1925), No. 8, pp. 165–168, 184, figs. 13*).—Tests are reported which indicate definitely that the tensile stress set up in a concrete pavement by a 6-wheel truck is only about half as great as the stress produced by a 4-wheel truck of the same gross load. The tests also showed that the stress produced in the pavement by the 6-wheel vehicles is a function of the load on the wheels and not of the axle spacing. This seems to be true for all spacings of the rear axles greater than 3 ft., there being some indication that when the wheels are closer together than 36 in. the stress produced in the pavement may be increased.

It is also shown that under 6-wheel as well as 4-wheel trucks the maximum tensile stress occurs in the bottom of the slab, regardless of the axle spacing. Even though there is counterflexure of the pavement between the wheels, the tension developed in the top of the slab is of less magnitude than that developed in the bottom of the slab directly under the wheels. This latter tension, therefore, is the critical stress for 6-wheel as well as 4-wheel vehicles. Loads passing over the pavement 21 in. from the edge were found to produce an average stress less than 50 per cent as great as that produced by the same loads passing 9 in. from the edge.

The maximum deformation of the concrete slab was found to occur along the edge under both 4- and 6-wheel vehicles. When subjected to loads of varying magnitude applied at the same point, both the deflection and deformation of the slab were proportional to the load.

The action of sulphate water on concrete, D. G. Miller (*U. S. Dept. Agr., Public Roads, 6 (1925), No. 8, pp. 174–179, 183, figs. 4*).—In a further contribution to the subject (E. S. R., 51, p. 684; 52, p. 87), a summary of tests made by the University of Minnesota, the Minnesota State Department of Drainage and Waters, and the Bureau of Public Roads, of specimens of concrete immersed for one year in Medicine Lake, S. Dak., are reported. The specimens used were 2- by 4-in. cylinders, the majority of concrete, but a number also of Ottawa sand mortar. The total salt content of Medicine Lake was found to range between 2.34 and 4.72 per cent, consisting almost entirely of a combination of magnesium and sodium sulfates in which the magnesium salt greatly predominated.

None of the high-alumina cement cylinders showed evidence of any deleterious action. None of the standard Portland cement cylinders cured in steam at a temperature of 212° F., regardless of the length of time they were so cured or of other variables, showed any surface action from the lake water.

Curing in water vapor at temperatures of 155 and 100° was found to be of no value. Considerable deterioration was evident in all cylinders cured in the labratory in the moist closet, followed either by further curing in water or by storing in air, or both.

Under some conditions additions of blast furnace slag, calcium chloride, Cal, and ironite increased the resistance of the concrete, while additions of volcanic ash and Alkagel "A" were of little or no benefit.

Ventilation for the New Jersey poultry house, E. R. Gross (*New Jersey Stas. Hints to Poultrymen, 13 (1925), No. 12, pp. 4, figs. 5*).—Methods for the winter ventilation of New Jersey poultry houses are presented and discussed and apparatus therefor diagrammatically illustrated.

RURAL ECONOMICS AND SOCIOLOGY

Fundamental principles and aims of modern agriculture, T. Wölfer (*Grundsätze und Ziele Neuzeitlicher Landwirtschaft. Berlin: Paul Parey, 1925, 9. ed., rev., vols. 1, pp. VIII+441+29, figs. 61; 2, pp. IV+296, figs. [14]; 3, pp. IV+432, figs. 13*).—A general manual for farmers has been compiled in three volumes, dealing, respectively, with field operations, the home, and the organization of the business.

Farm costings, J. M. Adams (*[Irish Free State] Dept. Lands and Agr. Jour., 24 (1925), No. 4, pp. 351–373, fig. 1*).—Extracts from evidence given before the Irish Commission which issued reports noted earlier (E. S. R., 53, p. 596) are presented here. Actual costs were determined for 1920 on 18 Irish farms, and estimates based upon them have been prepared for 1914 and 1922. Crop costs per unit of area and of yield and the comparative costs of crops per acre are shown, together with tbe cost and value of certain crops per acre.

The cost of producing milk in 1920 was recorded for 204 cows on 13 farms, and estimates are drawn up on the basis of these records for the years 1914 and 1922. Also certain estimates corresponding to the crop costs for the earlier years have been prepared for 1923.

A farm in Brie, P. Germain (*Une Ferme dans la Brie. Thesis, Inst. Agr. Beauvais, 1924, pp. 128, pls. 5*).—A farm of 285 hectares (704 acres) in the Canton of Mormant in the Department of Seine-et-Marne, France, is the subject of this detailed description. The buildings and equipment, crops and livestock produced, and the outstanding farming methods are set forth.

The farming society of Cîteaux, B. Remy (*La Société Fermière de Cîteaux. Thesis, Inst. Agr. Beauvais, 1924, pp. 117, pls. 2*).—The equipment, crops and livestock produced, and the farming methods followed on a large-scale capitalized farm enterprise of more than 1,000 hectares (2,471 acres) in the Canton of Beaune in the Department of Côte-d'Or, France, are described in detail in these pages.

The economic and social importance of the time lease in German agriculture [trans. title], M. Sering (*Ber. Landw. Reichsmin. Ernähr. u. Landw. [Germany], n. ser., 2 (1924), No. 1, pp. 1–67*).—Part 3 by R. Seiff of a report of which earlier sections have been noted (E. S. R., 53, p. 291) deals with the rôle of the time lease in Germany in the region of large estates.

New farm rentals in Hungary [trans. title], R. Károly (*Kisérlet. Közlem., 26 (1923), No. 1–4, pp. 42–58*).—Beginning with the year 1921–22 the author investigated those rent contracts which, according to new regulations, must come under Government surveillance, and 270 cases on holdings of various sizes are reported upon. About 85 per cent specify rent payment in crop values. In the year 1913–14, the average rental on large businesses was stipulated as 117 kg. per hectare (104 lbs. per acre) of wheat, 152 kg. on medium-sized farms, and 200 kg. on small ones. In the year 1921–22, rentals calculated on the same basis were, respectively, 74, 100, and 114 kg. In the later year the rentals applied to arable, grazing, and pasture lands, and others, and to buildings.

Rentals in Hungary in 1922–23 [trans. title], R. Károly (*Kisérlet. Közlem., 27 (1924), No. 1–2, pp. 74–81*).—The author reviews the terms of the farm rent contracts which came into effect in the later year, continuing the report noted above. Of the 275 contracts considered, 7.55 per cent pertained to holdings larger than 500 hectares (1,235 acres), 55.27 per cent to those of between 50 and 500 hectares, and 36.18 per cent to those of under 50 hectares. Rentals were, respectively, 57, 30, and 33 per cent higher than those stipulated in the contracts for the earlier year.

Cash tenancy in the United States, C. L. STEWART (*Internatl. Rev. Agr. Econ. [Rome], n. ser., 3 (1925), No. 2, pp. 165–211, pls. 3*).—The lands upon which and the principal locations where cash rent is paid, the terms in which stipulated rents are stated, and the form of renting which is general in 16 Southern States, known as standing rent, are covered in this discussion. Money renting, which is said to have characterized over five-sixths of the approximately 600,000 farm leases in the United States in 1920 that were entirely on a nonshare basis, is then treated in considerable detail. The bibliography employed is similar to one published with an earlier article by Turner (E. S. R., 51, p. 293).

The town proprietors of the New England colonies, R. H. AKAGI (*Philadelphia: Univ. Penn. Press, 1924, pp. XIII+348*).—This study in the history of the New England land system consists of an account of their acquisition of the land and the organization activities and controversies of the town proprietors. The first part is a study exclusively of the landholding institution, the second of the effect of land speculation upon the town proprietors in the eighteenth century. A brief sketch is given of the western claims in the prerevolution period.

Some thoughts on land tenure in tropical Africa, H. M. LEAKE (*Empire Cotton Growing Rev., 1 (1924), No. 4, pp. 240–260*).—This is a discussion of the need of a well-defined system of land tenure on cotton tracts, emphasizing the importance thereto of three agencies, the Government, the cultivating community, and a landlord or capital-supplying class.

Sources of income of the Ohio farmer, J. I. FALCONER (*Ohio Sta. Bimo. Bul., 10 (1925), No. 8, p. 158*).—In some of the northeastern counties of the State over 75 per cent of the income is from dairy products, while in some of the western counties it is less than 10 per cent. Hog sales comprise 22 per cent, wheat 15, poultry 8, corn 5, and oats 4 per cent of the total income.

Farm mortgage financing in Texas, V. P. LEE (*Texas Sta. Bul. 330 (1925), pp. 3–67, figs. 21*).—A general survey of the Texas farm mortgage business as a whole is presented first, followed by a more detailed study of the business of each of several different types of institutions. In the first instance, the sources of information were the replies of 597 companies of all kinds to letters sent them by the investigators. The replies of 177 financial institutions and insurance companies are analyzed in detail.

Farm mortgage loans were found to run from 1 year in the case of the commerical banks to more than 30 in that of Federal and joint stock land banks. A relatively low percentage of the total farm mortgage loans was used for the immediate purpose of buying land and improvements. From 6 to 9 per cent of the total loans of all these mortgage institutions was used to pay off short-time indebtedness. Approximately 62 per cent of the mortgage loans of commercial banks was arranged to be paid off in one payment at the maturity of the loan, 46 per cent of those of insurance companies, 92 per cent of those of trust companies, and 38 per cent of farm mortgage companies. A large percentage of the banks and companies which reported on the effects of the Texas homestead exemption law held it to be antiquated and favored its abolishment or modification.

Thirteenth yearly report of the central board of the Land and Agricultural Bank of South Africa, T. B. HEROLD ET AL. (*Union So. Africa, Land and Agr. Bank So. Africa, Rpt., 13 (1924), pp. 47*).—This is the regular annual report, continuing the series previously noted (E. S. R., 52, p. 192).

The changes in the values of farm property [trans. title], W. ROTHKEGEL (*Ber. Landw. Reichsmin. Ernähr. u. Landw. [Germany], n. ser., 2 (1924), No. 1, pp. 80–94*).—A general decline of agricultural net yields in Germany with high

interest rates and heavy taxes and the general dearth of capital are held to have contributed to the decline in farm land prices since the war. Some comparisons are drawn up of the relative values of buildings, equipment, and land in 1914 by size groups of farms, and percentages of the total value represented by each of the factors of production are shown. By separating out the values for building and equipment, it appears that certain classes of poor soil may have had a comparatively high price.

It is held that if farm property prices decline the whole burden of the decline must be borne by the land, and that the decrease in value is greatest on large estates with poor soil, being less the better the soil and the smaller the business.

The author considers that land prices will remain permanently below the pre-war level and points out that entirely new schemes for the estimation of values must be worked out.

The produce of rice land, cost of cultivation, land values and other statistics for calculating the revenue demand, compiled by M. T. MYINT and M. S. YIN (*Burma Off. Commr. Settlements and Land Rec., Statis. Bul. 1* (*1924*), *pp.* [*5*]+*62*).—Two sets of tables have been compiled for certain districts of Lower Burma, India, showing the produce of land and cost of cultivation, and land sale, mortgage, and rental values for various periods between 1906 and 1915.

Rating and taxation of agricultural subjects in Scotland, J. H. M. HOME (*Highland and Agr. Soc. Scot. Trans., 5. ser., 37* (*1925*), *pp. 93–103*).—Notes are brought together on methods of assessment and collection of taxes under the heads of income tax, land tax, county rates and parish rates.

Efficient methods of retailing meat, R. C. LINDQUIST (*U. S. Dept. Agr., Misc. Circ. 54* (*1925*), *pp. II+44, figs. 6*).—This publication is based on a detailed survey of the operations of retail meat dealers in independent and chain stores in Chicago, Cleveland, and New York, which was begun in 1923 as a cooperative project between the bureau of business research of Northwestern University and the Bureau of Agricultural Economics. Those practices which are held to contribute to efficiency and success are described. The main topics discussed are how to choose a location, relation of store to successful business, personnel and management, purchasing, refrigeration and care of meat, cutting of meat, merchandising, meeting competition, and keeping records.

Incorporation plans for fruit marketing associations, H. C. HENSLEY (*Missouri Agr. Col. Ext. Circ. 168* (*1925*), *pp. 32*).—Suggested articles of incorporation and by-laws are drawn up.

Prorating expenses on co-operative shipments of livestock, T. D. MORSE (*Missouri Agr. Col. Ext. Circ. 161* (*1925*), *pp. 12*).—A fixed flat rate for the marketing of each kind of livestock is recommended, and some suggestions are offered as to its use.

Crops and Markets, [October, 1925] (*U. S. Dept. Agr., Crops and Markets, 4* (*1925*), *Nos. 14, pp. 209–224; 15, pp. 225–240; 16, pp. 241–256; 17, pp. 257–272; 18, pp. 273–288*).—Current notes summarizing the demand, supply, and prevailing prices of agricultural products, classified as livestock, meats, and wool; fruits and vegetables; dairy and poultry; grain; hay; feed; and cotton, are given in these numbers, with notes on foreign crops and markets.

A table in No. 15, compiled from a statement issued by a Spokane, Wash., apple growers' organization, gives cost data for the association for 13 seasons, 1912–13 to 1924–25, inclusive.

Monthly Supplement to Crops and Markets, [October, 1925] (*U. S. Dept. Agr., Crops and Markets, 2* (*1925*), *Sup. 10, pp. 313–344, figs. 3*).—Farm

wages data are featured in this number in tabulated average wages paid to hired farm labor, by States, in October, 1923–1925; average prevailing farm wage rates, by geographic divisions, 1910 to October, 1925, inclusive; and farm wage rates and index numbers, 1866 to October, 1925. The usual tabulations of estimated prices received by producers, receipts and disposition of livestock at public stockyards, livestock and meat and milk marketing statistics, cold-storage holdings, shipments of fruits and vegetables, and other data are given, together with a review of world agriculture and a summary of the price situation in the United States during September.

Report of the Committee on Stabilisation of Agricultural Prices, A. W. Ashby et al. (*[Gt. Brit.] Min. Agr. and Fisheries, Econ. Ser. 2 (1925), pp. 106, pls. 2, figs. 10*).—This is the second in a series of official reports on agricultural economics, of which the first was noted earlier (E. S. R., 54, p. 82).

Appointed to study the effect of changes in currency levels on the prices of agricultural products and the causes of seasonal fluctuations in such prices, the committee here presents a summary of the underlying principles of price stabilization and the bearing upon the agricultural price level of monetary instability and variation in the volume of supplies. The cooperative marketing of home products and the application of principles of centralized marketing to imported foodstuffs are subjects also of considerable discussion. A memorandum on the decline of British agriculture between 1870 and 1896 concludes the report. Appendixes give tables showing production, imports, and prices of cereals and flour over a period of years, and extracts from earlier statements bearing upon monetary problems.

Artificial prices a menace to economic stability, B. M. Anderson, jr. (*Chase Econ. Bul., 4 (1924), No. 2, pp. 17*).—The purchase by an export corporation, organized and financed by the Government, of the exportable surplus of those agricultural products the price of which is determined principally on the world market is held to be indefensible. In principle it would intensify the overexpansion of agriculture and distort the price-making system based on free enterprise and private property. It is thought also that certain very definite practical difficulties would lie in the way of the collection from individual farmer of funds intended to constitute the so-called equalization fee.

Index numbers of production, wages, and prices, J. I. Falconer (*Ohio Sta. Bimo. Bul., 10 (1925), No. 8, pp. 157, 158*).—A series of index numbers previously noted (E. S. R., 53, p. 898) has been continued to include data for May, June, and July, 1925. A new column showing Ohio farm purchasing power has been added to the table.

Prices of Ohio farm products, J. I. Falconer (*Ohio Sta. Bimo. Bul., 10 (1925), No. 8, p. 156*).—Tabulated index numbers of prices of Ohio farm products for June and July, with comparisons with the past four years, indicate a wide variation in the comparative level of various products. Wheat, corn, oats, hogs, horses, and beef cattle have had prevailingly low prices. Of these, wheat, corn, and hogs had, at the time of this report, risen above the general price level.

The hog situation, R. F. Taber (*Ohio Sta. Bimo. Bul., 10 (1925), No. 8, pp. 159, 160, fig. 1*).—The variation in average weekly prices and the average weekly receipts of hogs are graphically illustrated.

Some phases of the hard winter wheat grower's problem in readjustment, W. E. Grimes (*Jour. Farm Econ., 7 (1925), No. 2, pp. 196–221, figs. 10*).—Various phases of internal readjustment problems are discussed, and the conclusion is reached that aid can be rendered by securing for the wheat grower the premiums paid for high quality wheat and encouraging the adjustment of the wheat acreage per farm in the central and western portion of the hard

winter wheat belt to the area that can be seeded properly and in the right kind of a seed bed with the usual labor force and equipment of the farm. There are also advocated the production of the high protein dark hard wheat that is now on a domestic market basis and for which millers are paying premiums in terminal markets, sound cooperative action by farmers in the marketing of their products, wider adoption of improved varieties of crops and improved cultural practices, the keeping of livestock to the extent that the unemployed labor and the bulky feeds and by-products of the farm, as well as limited areas of feed crops grown, may be utilized, education that will acquaint the farmer with improved methods and practices and also keep him informed concerning the demands of the market, research that may point the way to improvements in agricultural production and marketing, and the refunding of farm debts into long-term paper, ways being provided for gradually retiring the principal of these debts. This was discussed by R. E. Willard.

Wheat and flax in the Northwest, A. H. Benton and R. E. Willard (*Jour. Farm Econ., 7 (1925), No. 2, pp. 222–228*).—Strains, the place in the cropping system, and the marketing of these crops are discussed. The reintroduction of flax production is held to be an important factor in reducing the wheat acreage.

Canada as a producer and exporter of wheat, C. P. Wright and J. S. Davis (*Food Research Inst. [Stanford Univ.] Wheat Studies, 1 (1925), No. 8, pp. 217–286+[1], figs. 15*).—This review is presented under the main heads of physiographic conditions of western Canada, agricultural practices, the development of transportation and of marketing organization, the progress of settlement and wheat production, some economic aspects of farming, the Canadian wheat movement from farm to market, the position of Canadian wheat in the world markets, and the future of Canadian wheat production and export. Classified bibliographical notes are presented in the appendix under each of these topics, and some statistical tables are included.

The **history of agriculture in Wales,** C. B. Jones (*Welsh Jour. Agr., 1 (1925), No. 1, pp. 5–16*).—The early system of land tenure which prevailed in Wales was characteristically that associated with early stages of agricultural and social and economic development, having been intricately bound up with the tribal organization of Welsh society. It is noted that this system was breaking down by 1282 but that it remained largely in operation until the reign of Henry VIII. Laws covering tillage operations are briefly noted, and systems of farming and livestock production are described.

Some aspects of the agricultural conditions in Cardiganshire in the nineteenth century, R. Phillips (*Welsh Jour. Agr., 1 (1925), No. 1, pp. 22–28*).—Records taken from account books or ledgers kept during the period 1823–1894 for a 200-acre farm in the Wyre Valley district of Cardiganshire, Wales, are summarized, showing principally the wages of farm laborers and the methods of marketing the principal commodities produced.

The influence of European migration in the development of the principal countries of South America [trans. title], L. Híjar y Haro (*Bol. Soc. Mex. Geogr. y Estadís., 5. ser., 11 (1924), No. 1, pp. III+166, pls. 5*).—Statistical and historical studies of the situation in each of the South American countries as regards the extent of colonization and the possibility of and the provisions for further settlement are brought together here, with a review of rural colonization in New Mexico.

Economic conditions in India, P. Padmanabha Pillai (*London: George Routledge and Sons, 1925, pp. XVIII+330*).—Two chapters dealing, respectively, with agricultural development (pp. 69–98) and some problems of land and labor (pp. 99–128) are included in this study.

The replies of several governments to an inquiry with reference to the administrative organization of agriculture and expenditures (*Réponses de Quelques Gouvernements aux Enquêtes sur (a) l'Organisation Administrative et Libre de l'Agriculture; (b) les Dépenses en Faveur de l'Agriculture; dans les Différents Pays. Rome: Inst. Internatl. Agr., 1924, pp. XI+234*).—The replies are summarized as returned by 17 countries to a questionnaire requesting information as to the central official governmental agency devoted to agricultural interests, local or field services, and independent agricultural organizations, as well as budgets for agricultural expenditures. A table has been prepared showing official appropriations for the years 1913–14 and 1921–22. The appendix consists of a special report on the organization of and expenditures for agriculture in China.

Three official reports upon the agricultural depression, I. F. GRANT (*Economica [London], No. 12 (1924), pp. 336–352*).—Comparisons are drawn between the positions taken by British and Irish reports previously noted (E. S. R., 52, p. 693; 53, pp. 93, 596). Particular attention is paid to the discussions of the desirability of providing an agricultural subsidy, the importance of small holdings, agricultural credit, and education.

The tariff in relation to agriculture, J. VINER (*Jour. Farm Econ., 7 (1925), No. 1, pp. 115–123*).—General principles associated with the classical theory of international trade are set forth. One of the elementary corollaries of this theory is that no competitive industry can derive benefit from tariff protection of its products if that industry is substantially on an export basis. Thus, American agriculture has not been on the whole in a position to profit. As it moves toward the deficit stage, however, its capacity to profit from tariff duties on foreign agricultural products increases, and it is pointed out that there is some evidence that the process of change of convictions to conform to changes in economic interests, which is one of the outstanding features of European tariff history, will not be without a parallel in this country. It is held that the time has not yet come, however, when farmers as a whole can hope to gain as much from tariff protection on their own products and the continuance of protection for manufactures as they would gain from the gradual elimination of all protection.

The relation of the tariff to the sheep industry, J. F. WALKER (*Jour. Farm Econ., 7 (1925), No. 1, pp. 124–135*).—The author here advocates a tariff which would enable the sheepman in the United States to equalize his costs and compete with foreign-grown wools. He traces the history of the wool tariff to illustrate how any lowering has been followed by decreased wool production and inversely.

The tariff on American dairy products, B. H. HIBBARD (*Jour. Farm Econ., 7 (1925), No. 1, pp. 136–144*).—Dairy products are considered to furnish one of the best examples of those goods which may be helped a little or not at all by the tariff, yet may be made to appear popularly as an excellent example of products of the farm which are helped by restriction of importation.

Agricultural production and marketing in Atlantic County, New Jersey, W. C. FUNK, A. G. WALLER, A. R. ELDRED, and H. KELLER, JR. (*New Jersey Stas. Bul. 416 (1925), pp. 39, figs. 11*).—Data representing the agricultural production of this county were obtained by visiting over 500 farmers. Information as to the amounts and kinds of products received in Atlantic City were obtained from transportation agencies, records of dealers and hotels, and the municipal market. This report is largely descriptive, on the one hand, of the population, industries, and transportation facilities of the area, its markets, and food consumption, and, on the other, of the trend of agri-

culture and the present status and prospects for the production of specific small fruits, truck crops, and poultry.

The human side of the farming business, A. W. ASHBY (*Welsh Jour. Agr., 1 (1925), No. 1, pp. 16–22*).—Subjects such as the age and physical quality of the farming population in relation to efficiency in manual work and its organization and direction on the farm, the activities of women, especially in areas where small farms prevail, as contributing to the success of the farming enterprise, the effect of the outlying farm upon the mental and moral qualities of the farm population and upon agricultural progress, and the relation between village social organization and migration on the part of the agricultural population as affecting farm organization and efficiency are suggested for methodical study. As a suggestive illustration of the application of systematic analysis to the investigation of human problems, the author reviews census returns in order to show the age of persons engaged in farm work in England and Wales in 1911, with some comparisons for earlier years.

Spare time in the country (*Internatl. Labor Off. [Geneva], Internatl. Labor Rev., 9 (1924), No. 6, pp. 917–938*).—The development of schemes for providing leisure in rural districts in England and for organizing and directing recreation and the use of leisure is set forth here.

The function, policy, and program of the country church, J. D. RAY ET AL. (*Tex. Agr. Col. Bul., 3. ser., 9 (1923), No. 8, pp. 19*).—This is the report of a committee of the rural ministers' conference held at the Texas A. and M. College in July, 1923, stating certain general principles with reference to the function of the country church and outlining a program for it.

Live stock and animal products statistics, 1924, F. J. HORNING (*Canada Bur. Statis., Livestock and Anim. Prod. Statis., 1924, pp. 88, figs. 12*).—The present report on the livestock and allied industries in Canada is the sixth of a series previously noted (E. S. R., 52, p. 792).

AGRICULTURAL AND HOME ECONOMICS EDUCATION

Agricultural education [in Northern Ireland] (*North. Ireland Min. Agr. Ann. Rpt., 3 (1923–24), pp. 8–17*).—These pages review the use of Government funds in promoting and spreading agricultural education, mainly by itinerant instruction, winter classes, awards of scholarships, exhibits, and the support of certain schools and colleges.

The consolidated school, C. G. SARGENT (*World Agr., 5 (1925), No. 1, pp. 368, 369, figs. 3*).—Mention is made of the equipment and teaching program of several modern rural schools in the Great Plains area of western Kansas and Nebraska and eastern Wyoming and Colorado.

Farm household management travelling schools, M. BEAUFRETON (*Internatl. Rev. Agr. Econ. [Rome], n. ser., 3 (1925), No. 2, pp. 147–164*).—A brief historical sketch is given of the development of this system of village education for women in several important countries of Europe, and the arrangement of premises and equipment, the management and teaching staff, the students, the length of the course, syllabuses and methods, and model budgets are described.

This form of instruction is regarded as the point of departure for stable organization in the way of farm women's clubs.

The apprenticeship system of training in farm household management [*trans. title*], A. GAUSEBECK (*Veröffentl. Landw. Kammer Rheinprov., No. 6 (1925), pp. 32*).—A recent ministerial decree provides a system of apprenticeship training for women and girls of the rural sections of the Rhine Province

of Germany. The purpose of such training, the privileges and duties of apprentices and of trainers, and the examinations which may be taken after three years are set forth.

The nursery school in the home economics curriculum, H. MONSCH (*Jour. Home Econ., 17 (1925), No. 11, pp. 639–642*).—This article outlines the way in which a nursery or play school was conducted in the summer school sessions at Cornell in 1924 and 1925. Beginning with the 1925–26 regular session a similar school became a laboratory part of the four-year course in home economics.

Plant and animal improvement, E. ROBERTS and E. DAVENPORT (*Boston and London: Ginn & Co., 1925, pp. XII+174, pls. 5, figs. 103*).—The processes involved in the improvement of plants and animals are set forth in the material here assembled into a textbook on heredity for agricultural students.

Second year poultry, E. WILSON (*La. Agr. Col. Ext. Circ. 69 (1924), pp. 34, figs. 12*).—More advanced work is outlined for club members who may have completed the first-year course previously noted (E. S. R., 47, p. 598).

Introduction to rural economics, P. L. VOGT (*New York: D. Appleton & Co., 1925, pp. XII+377, figs. 63*).—This textbook has been designed to meet the needs of agricultural students in high schools and for use in short courses in agricultural colleges. It is written primarily for those who will remain on the farm. Some elementary principles of general economic theory have been incorporated.

Home economics education, edited by D. SNEDDEN (*New York: Teachers Col., Columbia Univ., 1924, pp. VI+224*).—Papers presented in this volume represent a portion of the work of a special class formed by the editor during the 1922 summer session of Columbia University to study certain current problems of home economics education. They are grouped in five parts, numbers 2 to 5 of which, inclusive, correspond with the types of general and vocational courses deemed important. The papers are Introductory Considerations, and Home Economics Investigations: Some Proposed Hypotheses and Inquiries, both by D. Snedden; Proposed Units in Cultural Home Economics Course—Topic: Care of Children, by J. Hamilton; Proposed Units in Cultural Home Economics Courses, by M. R. Gill; Proposed General Course in Household Arts for the Junior High School, by N. Watts; Proposed Liberal Courses in Homemaking for Senior High Schools, by M. J. McBain; Proposed Course of Study—Cultural Home Economics: Introductory, by L. V. Clark; Proposed General Course in Home Economics for High Schools, by C. Tucker; Proposed Course of Study—Personal Regimen or Self-service, by A. Hillier and G. McAdam; Proposed Course of Study—Personal Regimen or Self-service: Introductory, by A. I. Robertson; Personal Regimen Course for Girls' Continuation School: Introductory, by M. E. Jones; Proposed Course in Vocational Homemaking Education, by M. A. Smith; Proposed Course of Study in Housing and Furnishing for a Senior High School, by H. M. Langner; The Homemaking Vocations: A Proposed Method of Job Analysis as a Basis for Courses of Instruction and Training, by M. H. French; A Proposed Teacher-training Curriculum, by A. Tilson; Proposed Course in Special Methods as a Part of the Curriculum for Training of Teachers of Vocational Home Economics, by H. M. Paul; and Proposed Course in Special Methods as Part of Curriculum for Training of Teachers for Home Economics, by F. M. McNally.

A general course in home economics for high schools, H. LIVINGSTONE (*Jour. Home Econ., 17 (1925), No. 11, pp. 642–644*).—The home economics curriculum is offered at Cass Technical High School in Detroit in three divisions

designated as social cooperation, health, and thrift, and these in turn are divided into a number of units of work.

Home improvement, V. P. MOORE (*Fla. Col. for Women, Home Demon. Div., Ext. Serv. Circ. 372 (1925), pp. 26, figs. 8*).—Some results of home improvement work done in one week by the home demonstration club girls in a short course held at the Florida State College for Women in 1924 are pictured. A home improvement contest plan is outlined, and suggestions are offered for home improvement bees and one-day demonstrations.

Textile information that functions in the life of the student, C. M. BROWN (*Jour. Home Econ., 17 (1925), No. 11, pp. 645–648*).—It is held that emphasis should be placed on the economic rather than on the technical phases of textiles in home economics courses both in college and high school. The practice should be such as will give experience applicable to home and everyday situations.

Simplifying home sewing, C. B. MCILROY (*N. Y. Agr. Col. (Cornell) [Ext.] Bul. 127 (1925), pp. 28, figs. 24*).—Equipment and methods of working are described and profusely illustrated.

Textiles and clothing, J. F. EDDY (*Ala. Polytech. Inst. Ext. Circ. 84 (1925), pp. 12, figs. 11*).—Brief directions are given for the alteration of commercial patterns.

Clothing club work: First and second year, R. S. SINCLAIR (*N. Mex. Agr. Col. Ext. Circ. 81 (1925), pp. 42, figs. 47*).—The fundamental operations essential to home sewing and garment making are set forth as a guide to leaders and members of first and second year demonstrations.

Clothing club work: Third and fourth year, R. S. SINCLAIR (*N. Mex. Agr. Col. Ext. Circ. 82 (1925), pp. 37, figs. 13*).—The more advanced course following the one noted above consists largely of making and caring for the schoolgirl's wardrobe.

The place of clothing in the extension program, L. W. REYNOLDS (*Jour. Home Econ., 17 (1925), No. 11, pp. 635–638*).—The author emphasizes the responsibility of the clothing specialist in designing a teaching program which will meet the real needs of typical homes in the community. Suggestions are offered for correlating subject matter in clothing with that in other projects.

Extension work among negroes, conducted by negro agents, 1923, J. A. EVANS (*U. S. Dept. Agr., Dept. Circ. 355 (1925), pp. 24, figs. 7*).—The inception and organization of this work, its finances, certain retarding influences, and results and methods are reported upon here.

Report of extension and demonstration work on the Island of Hawaii, R. A. GOFF (*Hawaii Sta. Rpt. 1924, pp. 18–21, fig. 1*).—Reports are presented with reference to the Glenwood Substation and demonstration farm and the general activities of the extension agent.

Boys' and girls' club work, M. GREENE (*Hawaii Sta. Rpt. 1924, pp. 21–24, figs. 2*).—The progress of club work in Hawaii in 1924 is reviewed.

Fairs (*Ala. Polytech. Inst. Ext. Circ. 90 (1925), pp. 43*).—Suggestions are offered for exhibiting and scoring fruits and vegetables, livestock, poultry, and bees and honey, and for organizing boys' and girls' clubs and home demonstration exhibits.

FOODS—HUMAN NUTRITION

The food value of edible gelatin, T. B. DOWNEY (*Nation's Health, (1925), No. 5, pp. 316–318*).—The value of gelatin as a supplemental prot[ein] and as a protective colloid in combination with milk and ice cream is discuss[ed] with data from feeding experiments with rats showing the beneficial affects

growth and health of adding 1 per cent of gelatin to a milk diet and to plain ice cream. Clinical evidence is also cited, indicating similar benefits on supplementing milk with gelatin in the feeding of malnourished children and in the dietary treatment of fever, tuberculosis, and diabetes.

"Thus theoretical deductions, experimental evidence, and clinical experience indicate that gelatin by virtue of its colloidal properties should prove a valuable aid in the digestion and absorption of the nutrients of cow's milk by infants and young children. These data warrant a thorough investigation of the utility of gelatin in infant feeding. It is further demonstrated that in many special dietaries these colloidal properties may have a most significant influence, these benefits being secured in addition to the nutritive value, which gelatin possesses as a protein. As a protein gelatin is well utilized in a number of food combinations, notably with the cereal grains, barley, oats, and wheat."

Gluten of flour and gas retention of wheat flour doughs, A. H. Johnson and C. H. Bailey (*Cereal Chem.*, *2* (*1925*), *No. 2*, *pp. 95–106*, *figs. 3*).—In this contribution from the Minnesota Experiment Station, data are reported which indicate that the retention of gas in wheat flour doughs and the consequent volume and texture of the bread are due in large part to the gluten content of the flour.

Diluting the percentage of gluten with starch was found to lower the gas-retaining power of the dough as measured by the method of Bailey and Johnson (E. S. R., 53, p. 410). The gas-retaining power of the dough was also lowered by treatment with 96 per cent alcohol and with water. This is attributed to the alteration brought about in the colloidal condition of the glutenin. Rye flour dough was found to have a high rate of gas production but a low gas-retaining capacity.

The proximate composition of certain Pacific coast fishes, D. B. Dill (*Indus. and Engin. Chem.*, *17* (*1925*), *No. 6*, *pp. 629*, *630*).—Analyses similar to those previously reported for sardines and various other fishes of the Pacific coast (E. S. R., 46, p. 460) have been made of other edible fish in the same region. These include herring, shad, sablefish, smelt, sole, halibut, sand dab, cod, salmon, bass, croaker, kingfish, barracuda, hake, yellowtail, horse mackerel, and albacore.

Losses sustained in preparing poultry for the table, W. M. Vernon (*Poultry Sci.*, *3* (*1924*), *No. 6*, *pp. 187–193*).—Literature on the dressing shrinkage and composition of the edible portion of poultry and on the relative amounts of edible material in poultry and various beef, pork, and lamb products is reviewed, and new data are reported on the amount of waste in the preparation for the table of three types of poultry—fryers, roasters, and hens.

Four birds in each class were used, all of which were fattened on a buttermilk ration for 10 days before killing and were dressed, drawn, and weighed in a uniform manner. The cooking was done by housewives cooperating in the study. The data obtained included live and dressed weight, weight after cooking, and weight of bones and waste tissue. From these figures and the dressed weight cost per pound, the costs per edible pound were calculated. The average edible weights in percentage of live weight of the fryers, roasters, and hens were 35.56, 46.9, and 40.62 per cent, respectively. With estimated dressed weight costs of 26, 28, and 28 cts. a pound, respectively, the costs per edible pound for the three types were 78, 60, and 69 cts. On the basis of these results, the author ranks the "efficiency" of the three types in decreasing order of roasters, fowls or hens, and broilers or fryers.

The use of dried milk in infant clinics [trans. title], L. Guinon, L. Ribadeau-Dumas, and E. Vincent (*Lait*, *5* (*1925*), *No. 46*, *pp. 585–594*).—This

is a general discussion of the authors' experience in the use of dried milk in a clinic for babies at a health center in Mandres, France. The milk powder was a half skimmed product that was distributed in sterilized nursing bottles and made up by the visiting nurses to the required volume by the addition of boiling water, thus insuring a sterile product. The milk was given without supplement to babies under 15 months of age and on the whole proved satisfactory. Although a few of the babies showed an intolerance to the milk, the number was not so great as of those unable to take sterilized milk. Digestive troubles were rare, and summer complaint was almost entirely avoided.

The authors are of the opinion that while dried milk will not solve all of the problems of infant nutrition, it is of particular value for dispensary use for young babies of delicate constitution.

Acidophilus milk a therapeutic agent and health drink, L. F. RETTGER (*Amer. Food Jour., 20 (1925), No. 6, pp. 301, 302*).—A general discussion of the preparation, properties, and uses of *Bacillus acidophilus* milk, with several references to the literature.

Permanence of results obtained by L. acidophilus therapy, N. KOPELOFF (*Soc. Expt. Biol. and Med. Proc., 22 (1925), p. 393*).—Further evidence is reported that the effects of *Lactobacillus acidophilus* therapy for constipation and diarrhea persist for some time after discontinuance of the treatment (E. S. R., 49, p. 363). One case is cited in which the benefits persisted for over two years, 3 cases for over a year, and 10 for from 3 to 6 months.

The control of foods eaten raw, H. N. BUNDESEN (*Jour. Amer. Med. Assoc., 85 (1925), No. 17, pp. 1285–1288*).—This paper, by the commissioner of health of Chicago, Ill., outlines the legal measures taken in that city to secure freedom from bacterial contamination in milk, cream, certified milk, ice cream, oysters, fruits and vegetables, carbonated beverages, raw meat, and sausage.

Bacterial content of head lettuce, L. B. JAMES (*Amer. Food Jour., 20 (1925), No. 6, pp. 302–304, 310*).—Determinations of the bacterial count of head lettuce under varying conditions are reported from the Bureau of Chemistry, U. S. D. A. With fresh untrimmed lettuce, the count was much higher on the surface than in the interior of the head, but with increasing length of storage under ordinary room conditions, the bacterial count in the interior increased much more rapidly than on the outside. The bacterial count of lettuce stored at a lower temperature, 21° C. (69.8° F.), and under controlled humidity was much lower and the lettuce remained in good condition much longer. Lettuce heads which had been trimmed and washed in the market were much more highly contaminated throughout the head than unwashed lettuce, and similar results were obtained with washed lettuce stored at 20°. The practice of washing lettuce before storing in the refrigerator is considered unwise as favoring more rapid bacterial growth.

Clostridium multifermentans in chocolate cream candies, G. A. HILL (*Jour. Bact., 10 (1925), No. 5, pp. 413–420, figs. 2*).—From 11 out of 24 samples of chocolate creams which had spoiled through cracking, the author isolated a saccharolytic anaerobe thought to be *C. multifermentans*. The organism was also isolated three times from mazetta cream, a commercial preparation used in confectionery as a foundation for cream fillings, and three times from egg albumin. The inoculation of 15 samples of unspoiled chocolate creams with a pure culture of the organism caused splitting in 9 cases. The cultural and morphological characteristics of the organism are outlined.

A study of methods of disinfection of eating utensils in the U. S. Army, S. A. MOULTON (*Mil. Surg., 57 (1925), No. 3, pp. 268–279, pls. 2, figs. 3*).—In connection with this investigation of the present regulations governing dishwashing in the Army, it is reported that of a number of organisms tested those

showing the greatest resistance to heat, *Staphylococcus albus*, *Bacillus coli*, and *B. typhosus*, did not survive a temperature of 75° C. (167°F.) for 5 minutes. Immersion of eating utensils after thorough washing and rinsing in water at 75° for 5 minutes, with drying by draining instead of with dish towels, is recommended as a safe procedure. Metal equipment, such as knives, forks, and spoons, after thorough washing, rinsing, and drying with towels, should be placed in a hot oven for the completion of disinfection.

An apparatus for the disinfection of eating utensils involving the use of live steam is described and illustrated.

Dietary regulations in public institutions of Denmark, L. S. Fridericia (*Nation's Health, 7 (1925), No. 5, pp. 309–312*).—The author discusses the methods employed in Denmark for dietary regulations in public institutions and presents some of the Danish dietary standards. These are based largely on two series of investigations, one by P. Heiberg and Björum under the auspices of the Danish statistical department and the other by Hindhede. The standards developed from the first investigation were based on household accounts of a large number of families throughout a year and from the second on a smaller number of dietary studies but under more personal control. Tables are given of the calories, protein, fat, and carbohydrate of the diets of farmer and peasant families in the country and laboring-class and well-to-do families in the city according to both standards and of the percentage of calories from different groups of nutrients in these dietaries. The figures for the most part are pre-war figures. The minimum and maximum values in the first table are as follows: Calories 2,730 and 4,509, protein 79 and 149 gm., fat 96 and 140 gm., and carbohydrate 358 and 650 gm.

The range in percentage of calories from different groups of foodstuffs was as follows: Cereals from 29.4 to 47.2; vegetables, potatoes, and fruits from 5.7 to 13; milk, cheese, and eggs from 8 to 12.8; meat, pork, and fish from 6.8 to 14; butter, margarine, and fat from 13.5 to 24.8; sugar from 8.7 to 14.1; and beer from 0.3 to 2 per cent.

A comparison is given of the average distribution of calories in the various food groups in the dietary standards for a Danish public home for aged persons, for laboring-class families in Danish towns averaged according to both the Heiberg and Hindhede standards, and for an American aged men's home reported previously (E. S. R., 22, p. 560). These figures are, respectively, as follows: Cereals 38.9, 37, 41.3, and 27.1; vegetables and fruits 7, 9, 7, and 11.6; milk, cheese, and eggs 18.5, 8, 8, and 8; meat, pork, and fish 7.3, 14, 13, and 27.9; butter, margarine, and fat 17.7, 19, 19.5, and 12.2; sugar 10.6, 11, 10.9, and 13.2; and beer none, 2, 0.4, and none.

It is noted that recent dietary regulations in Denmark have been influenced by the experience gained in the World War and emphasized by Hindhede that it is not necessary to depend upon animal protein to the extent formerly thought necessary (E. S. R., 50, p. 164), and also by the practical experience in regard to lack of vitamin A in some Danish institutions as brought out in various papers by Bloch (E. S. R., 51, p. 267).

The pancreatic response to carbohydrate ingestion, E. L. Sevringhaus and M. E. Smith (*Science, 61 (1925), No. 1569, pp. 92, 93, figs. 2*).—Curves showing the glucose concentration in the blood at definite periods after eating are presented to illustrate different types of reaction to food ingestion with respect to blood sugar concentration.

The most common type is considered to be one in which there is first a definite rise in blood sugar concentration, followed by a brief decrease and then a rise to normal value. The period of decrease is accompanied by a

feeling of hunger. Another type is illustrated by a gradual decrease in blood sugar accompanied by a constant marked hunger. Striking differences are shown in the curves of blood sugar concentration in the same subject after identical meals, one taken after a 3-day fast and the other without preliminary fasting. The former was characterized by a marked increase in sugar concentration for about 2 hours, followed by a gradual decrease and the latter by only a slight increase over the normal level. In the first case there was no feeling of satisfaction from the meal until after about 2 hours and in the second a definite satisfaction almost immediately.

The authors explain these observations essentially as follows: The hyperglycemia during food absorption acts as a stimulus to insulin production, with resulting storage of glycogen and utilization of glucose. In some cases the production of insulin is in excess of the need of it and a resulting hypoglycemia occurs, accompanied by the symptoms of hunger. In the case of the same subject eating the same meal after a 3-day fast and after regular meals, the marked increase in blood sugar concentration in the first case might be attributed to delayed production of insulin following the fasting period.

Studies on the comparative physiological importance of iron and zinc [trans. title], G. BERTRAND and H. NAKAMURA (*Ann. Inst. Pasteur, 39 (1925), No. 8, pp. 698–707, figs. 6*).—In a study of the importance of iron in nutrition, conducted along lines similar to those of a previous study of zinc (E. S. R., 52, p. 161), the addition of small amounts of iron to a basal diet carefully purified of traces of iron was found to have but little effect on the prolongation of life of young mice except when the animals were not placed upon the experimental diet until several days after the usual period of weaning. A slight favorable effect was noted in this case, but the difference was not so marked as in the case of zinc.

The effect of fluorine as sodium fluoride on the growth and reproduction of albino rats, J. A. SCHULZ and A. R. LAMB (*Science, 61 (1925), No. 1569, pp. 93, 94*).—In studies conducted at the Iowa Experiment Station, fluorine was incorporated as sodium fluoride in a basal ration of yellow corn 76, meat meal tankage 10, linseed oil meal 10, bone meal 2.5, and common salt 0.5 parts in amounts constituting 0.05, 0.1, 0.15, and 0.25 per cent, respectively, of the ration. On the first ration the rats grew at a normal or slightly better than normal rate, and the 2 females in the group reproduced and raised two litters of young during the 9 months of the experiment. On 0.1 and 0.15 per cent of sodium fluoride growth was somewhat retarded, and the animals appeared to be in poor nutritive condition. Reproduction took place but not all of the litters were raised. All of the 7 rats on the ration containing 0.25 per cent of sodium fluoride died in from 8 to 14 weeks without having reached a weight of 100 gm.

In a second series of experiments, amounts of sodium fluoride varying from 0.001 to 0.25 per cent of the ration were fed. On these rations the limiting amount of sodium fluoride for satisfactory growth appeared to be at 0.1 per cent and for reproduction 0.025 per cent.

Striking effects of excessive fluorine on the teeth were observed. With increasing amounts of fluorine there was rapid and abnormal growth of the upper incisors.

The "bios" question, F. W. TANNER (*Chem. Rev., 1 (1925), No. 4, pp. 397–472*).—This is a critical review, largely from the standpoint of bacteriological technique, of the extensive literature on bios. The author is of the opinion from the evidence reviewed that bios is not a vitamin. The question as to whether it is or is not essential to the growth of yeast is still in the con-

troversial state, and much of the evidence is questionable on account of carelessness in technique. An extensive list of literature references is appended.

The nomenclature of the vitamines, C. FUNK (*Science, 62 (1925), No. 1598, pp. 157, 158*).—The author proposes a new nomenclature for vitamins in which it is suggested that substances now recognized as of the nature of vitamins be placed in two groups. In the first group, to be known as "vitamines," are included vitamins B and C, the yeast growth-promoting vitamin commonly known as bios, which the author would designate as vitamine D, and possibly a fourth, vitamine P or antipellagra vitamine. The second group, to be known as "vitasterols," would at present include vitasterol A or the antixerophthalmic vitasterol, vitasterol E or the antirachitic vitasterol, and vitasterol F or the reproduction vitasterol (vitamin X of Evans and Bishop).

Recent progress in vitamin research, S. S. ZILVA (*Jour. Soc. Chem. Indus., 44 (1925), No. 36, pp. 445T–450T, figs. 3*).—This is a summary of recent progress in the investigation of the fat-soluble vitamins, the antirachitic function of light, and the antiscorbutic vitamin. Studies from the author's laboratory on the differentiation of vitamin A and the antirachitic vitamin (E. S. R., 50, p. 771) and on the attempted isolation of vitamin C from lemon juice (E. S. R., 52, p. 710) are reviewed in particular detail.

Studies in the physiology of vitamins.—III, Quantitative aspects of the relation between vitamin B and appetite in the dog, G. R. COWGILL, H. J. DEUEL, JR., and A. H. SMITH (*Amer. Jour. Physiol., 73 (1925), No. 1, pp. 106–126, figs. 5*).—In this continuation of the investigation previously noted (E. S. R., 50, p. 465), the authors have attempted to determine the vitamin B requirement of dogs in terms of the amount necessary to restore and maintain the appetite following loss of appetite on a ration adequate for maintenance except for vitamin B.

In the first series of experients, dogs were fed the basal ration until they showed definite loss of appetite, at which point a single dose of a vitamin B concentrate was given and the length of time during which there was a restoration of appetite was recorded. The amount of the concentrate given, divided by the product of the average body weight of the animal during the experimental period and the number of days during which the appetite was maintained, was taken as the daily requirement of the concentrate. The concentrates tested were yeast vitamin powder (Harris) and Vitavose, a wheat embryo concentrate supplied by the Ward Baking Company. Preliminary tests on rats indicated that the Vitavose was slightly lower in its vitamin B content than fresh brewery yeast, while the yeast vitamin powder was known to be about seven times as potent as brewery yeast.

Although the results varied somewhat with the individual animal, the requirement of the yeast vitamin powder appeared to lie between 50 and 60, and that of Vitavose between 500 and 600 mg., per kilogram of body weight per day. In control experiments with beef extract, which does not contain vitamin B, in place of the vitamin B concentrate, amounts up to 20 gm. daily proved incapable of restoring or maintaining the appetite. This is thought to furnish additional support to the belief that vitamin B exerts a definite effect upon the appetite, and that the effect is not due to an increased flow of gastric juice.

In a second series of experiments, the vitamin concentrates were given in daily doses instead of in a large single dose. The yeast vitamin powder was tested in doses of 20, 30, 40, 50, and 60 mg. per kilogram per day. Of these, 40 mg. per kilogram appeared to be the minimum daily dose for satisfactory maintenance of appetite. On the basal diet with this addition, two

dogs were kept for periods of 420 and 470 days, respectively, in normal condition, with no loss of appetite. With Vitavose the minimum daily dose appeared to be about 600 mg. per kilogram.

In discussing the apparent variations in the vitamin B requirement of individual animals, the following factors are suggested as possibly contributing to this variation: "(1) The degree of absorption of the vitamin from the alimentary canal, (2) the store of this essential in the tissues at the time the animal is placed in the experiment and the capacity of the individual to store the food factor, (3) the quantity of vitamin lost through excretory channels, and (4) a possible difference in metabolism among the animals." In regard to these factors, it is considered not improbable that any condition promoting catharsis, such as increased roughage in the ration, might prevent the absorption of vitamin B, or that the absorption might be affected by the proportion of other ingredients of the ration. It is thought unlikely that there is any considerable storage of vitamin B in the dog, but the general nutritive condition of the animal at the beginning of the experiment is thought to play an important rôle in determining the length of time the appetite can be maintained on a vitamin B-free ration. Consumption of the feces was shown to prolong the time before lack of vitamin B became evident. That a definite relationship exists between the vitamin B requirement and metabolism is considered to be quite definitely proved and is to be discussed in another paper.

Rickets and cholesterol, O. Rosenheim and T. A. Webster (*Lancet [London], 1925, I, No. 20, pp. 1025, 1026*).—Data are reported on the antirachitic activation of cholesterol by irradiation in a 2.5 per cent solution in liquid paraffin in a rotating quartz flask for ½, 5, and 10 hours, respectively, and in an atmosphere of nitrogen and of air. The irradiated cholesterol was fed in 0.2-, 2-, and 4-mg. doses to rats on the Sherman-Pappenheimer low phosphorus diet 84, and the diagnosis of rickets made from radiographs at the end of the experimental period. Determinations of the inorganic phosphate content of the mixed blood of each group of six rats are also reported.

The lowest dose of the material activated for the shortest period of time was without protective properties, as shown by the development of mild rickets and by no rise in the blood phosphate over the concentration in the rachitic controls. Rickets did not develop in any of the other groups. In commenting on these results, which confirm the previously reported ones of Hess and of Steenbock and their coworkers, the authors state "the fact that antirachitic properties can be experimentally conveyed to such a well-defined chemical substance as crystallized cholesterol correlates the proved photosynthesis of this vitamin by the plant with its presumed photosynthesis in the skin, and thus affords a rational explanation for the beneficial effect of light in the cure and prevention of rickets. The presence of cholesterol and its derivatives in the skin and its fatty secretions, together with the easy absorption by the skin, of such fats rich in cholesterol as lanolin, would appear to strengthen the assumption that a vitamin formed from cholesterol in the skin under the influence of light would be easily absorbed and then liberated into the blood stream."

TEXTILES AND CLOTHING

The distribution of stresses in cotton products, H. P. Gurney (*Jour. Textile Inst., 16 (1925), No. 9, pp. T269–T289, figs. 25*).—Mathematical considerations demonstrate that in cotton products certain approximate trends will exist between the degree of twist, coefficient of friction, strength and

efficiency of stress distribution, cotton concentration, modulus of elasticity, and other physical constants.

In general, stresses serve two functions, the principal being to transmit service loads, while the auxiliary function is to consolidate the cotton fibers so as to cause the product to hold together, the consolidating tendency varying with the angles of inclination of plying or weaving. The resistance to slipping of fiber against fiber in cotton yarn increases as the fiber diameter decreases and as the fiber surface coefficient of friction increases.

The efficiency of stress distribution increases as the mean fiber length, as the uniformity in length, and as the coefficient of interfiber friction, but not relatively as rapidly. The efficiency of stress distribution, assuming infinite coefficient of friction, would decrease the greater the twist, the greater the ratio of yarn cross-sectional contraction to elongation, and the greater the exponent m in the relation $\sigma=(Ec_\varepsilon)^m$ where σ is stress, c cotton concentration, and E elongation. With respect to twist, the efficiency exhibits a maximum which increases with the interfiber coefficient of friction. The maximum will be less the greater the twist required to produce the maximum stress distributing efficiency.

Plying, weaving, and even rubberizing, act in much the same direction as increasing the twist, and should be considered in the manufacture of basic yarns.

Study of relation of yarn strength to fiber strength in a 23–5–3 cord (*Lowell [Mass.] Textile School Bul., 28 (1925), No. 4, pp. 3*).—Tests by L. Wilcox and C. A. Anderson on 23–5–3 tire cord made from combed Egyptian cotton showed the average strength of the cord to be 7.415 kg., strength of single fibers 5.822 gm., numbers of fibers in cross sections of single 23's and 23–5–3 respectively, 149 and 2,238, and the average diameter of single fibers 0.0157 mm. The proportion of fiber strength realized in 23–5–3 amounted to 57 per cent.

Bast fibres as substitutes for cotton, C. F. Goldthwait (*Textile World, 67 (1925), Nos. 11, pp. 39–42, figs. 2; 13, pp. 43–49, figs. 3*).—The structure and methods of preparing bast fibers, particularly fiber flax, are described, American seed-flax straw and problems encountered in its utilization are discussed, and comment is made on the processes of bleaching flax, hemp, and jute, and on the progress of cottonizing flax and hemp.

The behaviour of bast fibres under the influence of caustic alkalies, C. R. Nodder and R. W. Kinkead (*Jour. Textile Inst., 14 (1923), No. 6, pp. T133–T156, pls. 2, figs. 5; also in Linen Indus. Research Assoc., Research Inst. Mem. 14 (1923), pp. 24, pls. 2, figs. 5*).—Investigations under the auspices of the Linen Industry Research Association dealt with the percentage contraction produced by sodium hydroxide solutions of different strengths in single flax and ramie fibers and flax and ramie yarns, and the twisting behavior of ramie and flax fibers during mercerization. The bearing of the findings on the production of a high luster upon materials composed of bast fibers is pointed out.

The action of strong solutions of caustic soda on flax yarn and fabrics under conditions of mercerising, P. P. Viktoroff (*Abs. in Jour. Soc. Dyers and Colourists, 41 (1925), No. 4, pp. 143–145*).—Investigations in collaboration with N. N. Malyutin at the High Technical School in Moscow showed that the elasticity of flax fabric increases considerably under the action of sodium hydroxide solutions but not to the same degree as cotton fabric. A decrease of the absolute tensile strength of the flax fabric was observed in all tests, the mean tensile strength being 93 per cent of the initial strength. On the other hand, the absolute tensile strength of the cotton fabric increased up to 125 per cent

of its initial strength under the action of sodium hydroxide (53° Twad.). The luster of flax yarn and flax fabric is increased considerably, especially if the treatment is effected under tension. The influence of sodium hydroxide on dyeing properties is also reported on.

Properties of the wool fibre, F. A. HAYES (*Textile World, 68 (1925), No. 1, pp. 89, 91, 93, 105, figs. 3*).—This deals with the structure and quality of wool with reference to the effect of the manufacturing processes.

The wool year book, 1925 (*Manchester, Eng.: Marsden & Co., 1925, 17. ed., pp. LXXXIII–XCI+584, figs. 314*).—This consists of data on the world's trade in wool and woolen goods, with information on the manufacture of textiles (E. S. R., 51, p. 172).

International trade in wool, L. A. WHEELER (*U. S. Dept. Com., Bur. Foreign and Dom. Com., Trade Inform. Bul. 301 (1925), pp. II+70, figs. 5*).—A summary of the sheep and wool production of the different countries of the world, giving the estimated numbers of sheep and the amount of wool produced by each in various years up to and including 1923. The exporting and importing countries are noted, and the trend of wool production is discussed.

MISCELLANEOUS

Fifth annual report [of Georgia Coastal Plain Station], 1924, S. H. STARR (*Georgia Coastal Plain Sta. Bul. 5 (1925), pp. 54, figs. 23*).—This contains the organization list, a report of the director on the work of the station, and a financial statement for the year ended December 31, 1924. The experimental work reported is for the most part abstracted elsewhere in this issue.

Report of the Hawaii Agricultural Experiment Station, 1924, J. M. WESTGATE ET AL. (*Hawaii Sta. Rpt. 1924, pp. [2]+24, figs. 12*).—This contains the organization list, a summary by the director as to the work of the year, and reports of the divisions of horticulture, agronomy, and chemistry, the extension and demonstration work on the Island of Hawaii, and of the Haleakala Substation. The experimental work recorded is for the most part abstracted elsewhere in this issue.

Annual Report of [South Dakota Station, 1924], J. W. WILSON ET AL. (*South Dakota Sta. Rpt. 1924, pp. 31*).—This contains a report by the director on the organization, work, and publications of the station; a financial statement for the fiscal year ended June 30, 1924; and departmental reports. The experimental work recorded is for the most part abstracted elsewhere in this issue.

Work of the Huntley Reclamation Project Experiment Farm in 1922, D. HANSEN ET AL. (*U. S. Dept. Agr., Dept. Circ. 330 (1924), pp. 32, figs. 6*).—The experimental work reported, as carried on at Huntley, Mont., is for the most part abstracted elsewhere in this issue.

Bimonthly Bulletin of the Ohio Agricultural Experiment Station, [September–October, 1925] (*Ohio Sta. Bimo. Bul., 10 (1925), No. 5, pp. 129–160, figs. 5*).—This number contains, in addition to several articles abstracted elsewhere in this issue, the following: Feeding Immature Corn is Wasteful Practice, and Manure Supplies Crop Need for Potassium.

NOTES

American Farm Economic Association.—The sixteenth annual meeting of the American Farm Economic Association was held in New York City December 28–30, 1925. As noted in the discussion on page 101, the general topic was Research in the Field of Agricultural Economics.

Following the reading of a résumé of the economic research projects being carried on in the experiment stations, the program was opened by the paper on The Need for Specific Objectives in Economic Research, by E. W. Allen, referred to editorially.

The Coordination of Economic Research was discussed by T. P. Cooper, who took the point of view of one interested in research as the basis for a continuing economic information service for agriculture. He described outlook studies, studies of efficient methods and practices in farm enterprises, the determination of the best adapted or standard types of farm organization, and prices and markets analyses as four categories into which research in this field could be classified. In a discussion of these papers J. R. Fain urged the association to take the lead in the coordination of agricultural economic research on a national basis, particularly through maintaining a continuing committee or council that would work through regional groups.

The presidential address of M. L. Wilson was entitled The Source Material of Economic Research and Points of View in Its Organization. In this he argued that "a type of economic material is required which the managerial portion of the farmer's mind can use as well as the husbandman portion now makes use of the technology of the productive processes. If we fill this need, we will have succeeded. . . . The function of the farm management investigator will more and more be to see the relationship between the biological and economic fields and to use the methods and results of both."

Purely economic facts such as prices, and social and institutional facts such as laws, customs, habits, market mechanisms and institutions, transportation systems, land tenure, credit, taxation, and many others which have been long established supply the source material from which the economist draws his interpretation and syntheses. The avenues of approach to the economic problems of agriculture were described as from the points of view of individual farms, individual commodities, and the national welfare. Farm management was defined as dealing with the first, marketing with the second, and political, social, and economic statesmanship with the third.

The Relationship Between Economic and Biological Research in Experiment Stations was set forth by J. G. Lipman. The debt of industry and human progress to scientific research by which they have been put on a sound economic basis was pointed out. According to Dr. Lipman "the analysis of production factors in agriculture must reckon with soils, plants, animals, plant and animal products, and finally man himself. . . . Biological research tends to disturb the tendency in our communities toward static conditions. Being in itself dynamic, it forces a like condition upon economic research."

In his discussion of this paper S. B. Haskell particularly emphasized the view that the present day need for economic research is in large part the result of the success of biological research. Improvements in production call for studies directed toward preventing maladjustments which would inevitably

come about as a result of the increased possibilities of production. A similar note was sounded by W. Hamilton in his paper entitled The Concept of an Evolving Social Order and Its Significance in Agricultural Research. He held that the organization of agricultural industries is not to be taken for granted. Economic research must be concerned with specific questions, but it must deal with them in terms of the larger requirements which may be imposed upon agricultural industries.

At a session devoted to research in marketing, F. App discussed What Cooperatives Desire from Workers in Farm Management and Marketing. Taking as his principal example the peach industry, he noted particularly the desirability of determining the localization of particular industries, the date of maturity of crops, and the varieties which enjoy particular market preference, and of being able to give out information which would aid cooperatives in determining the extent of competition to be expected in the markets between crops from different localities. W. P. Hedden visualized by means of numerous charts and graphs the effect on prices of an over supply of perishables at the peak of the season, the losses sustained by growers thereby, the shipments refused at terminal markets, the waste due to the necessity of paying freight upon superfluous shipments, and other difficulties arising from an imperfect understanding of the marketing and distribution of perishable products. In a paper entitled Research as an Aid to Establishing the Factors which Determine Market Prices, H. Working held that correlation studies dealing with those factors for which definite and reliable measures can be had make possible the improvement of forecasts of prices. Yield was regarded as a particularly effective measure.

A paper on Farm Business Analysis and Survey Methods, by W. I. Myers, outlined the advantages of the survey method of accumulating farm management data. Attention was given to particular phases of the method with regard to which differences in practice exist, as for instance the inclusion of the item of perquisites in estimates of returns from farms. A. Boss presented a case for the detailed farm business analysis by the cost route method. M. Ezekiel depicted the results of correlation studies designed to bring out the way in which differences in farm earnings can be accounted for by specific known factors. Data taken from studies of Corn Belt farms, the dairy enterprise in Chester County, and tobacco farms in Virginia had been analyzed and charted. In general, success was shown to depend upon the efficiency of the particular system, the effectiveness of methods and practices, and the combinations of input factors. As discussed editorially, C. L. Holmes explained the advantages and limitations of three types of analysis. Under the title of Studies of Maladjustment in Specific Areas, W. J. Spillman presented the results of changes in types of farming as indicated by census returns, exhibiting maps of Kansas in which data from several successive censuses were illustrated. He described also the readjustments that have taken place in a particular dry farming wheat region following the introduction of poultry, sheep, and other enterprises.

Another session took up research in farming adjustments. B. B. Smith reported the results of attempts to determine relationships between prices of cotton and variable factors of cotton production, and held that studies of this question point to the possibility of better and more specific results in the future. W. E. Grimes reported studies under way in Kansas designed to apply the results of outlook surveys in the adjustment of the production program in given farming regions of the State. R. M. Green discussed attempts at short time forecasting of the market and of price changes for wheat, corn, hogs, and cattle in 1925.

At a joint meeting with the American Economic Association bearing upon the topic of agriculture in our national policy, J. D. Black in Agriculture in Penumbra raised the question as to whether or not the tendency toward urbanization should be checked. C. C. Taylor, discussing Our Rural Population Debacle traced certain historical facts that led up to the condition of rural overpopulation and low standards of living among rural people a few decades ago, and pointed out some psychological aspects of the situation.

Round table conferences were held dealing with farm management, marketing, teaching, and agricultural statistics, and the meeting closed with a round table conference with the American Economic Association on land economics participated in by B. H. Hibbard, L. C. Gray, and R. T. Ely. In this there were pointed out the possibilities of development and the needs for research along the lines of land utilization, land valuation, taxation, tenure, and other phases that are continually becoming more sharply defined and appreciated.

Still another feature was a farm economics luncheon, at which A. Hobson outlined briefly the outstanding developments in certain European countries, either in the way of the growing recognition of the demands of agriculture upon the national attention or definite legislation designed to reorganize the landholding system or to aid agriculture. In discussing The Problem of the Agricultural Surplus in the United States, B. H. Hibbard emphasized the economic principles and conditions which inevitably contribute to the production of a surplus, and held that efforts to relieve the evils of the resulting situation must go deeper into the problem than merely endeavoring to facilitate the disposal of the surplus. T. N. Carver contributed to the discussion by enlarging upon the economic theory underlying any surplus.

Officers for the ensuing year were elected as follows: President, T. N. Carver; vice president, C. L. Holmes; and secretary-treasurer, J. I. Falconer.

Rural Sociology Section of American Sociological Society.—This group, meeting in New York City, December 29 and 30, 1925, devoted its attention entirely to the question of research in rural social problems. The report of the rural sociology research committee has been noted on page 106.

A report by W. Burr of a rural population study in Kansas analyzed decreases in the rural population in a certain locality, and cited the instance of a rural section where the institutions of the community had been materially improved in the last decade or so, even along with a decrease in the population, reaching the conclusion that rural depopulation does not necessarily mean deterioration or degeneration in the rural district.

B. L. Melvin discussed Research in Rural Group Organization in its static and dynamic phases. Group statics he held to be the making of cross section studies, depicting the family, neighborhood, and village as they exist. The dynamic phase of group action is to be studied in the way of analyses of membership, leadership, programs, and conclusions reached by rural organizations, as well as of group integrations, conflicts, disintegrations, and other changes.

A paper on Research in Rural Social Control was read by L. L. Bernard. In this he outlined in considerable detail a proposed program dealing with the problem of readjustments in social contacts and controls, and broken up into the two larger classifications of changes in social, including economic, forms and relationships and changes in attitude.

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RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

Chemistry in industry, II, edited by H. E. HOWE (*New York: Chemical Foundation, 1925, vol. 2, pp. XII+392, pls. 48, figs. 12*).—Among the 22 studies included in this second volume of the series previously noted (E. S. R., 52, p. 309), the following are cited as of particular interest in this section: Catalysis—A New Factor in Industry, by E. Hendrick; Casein—A Waste of One Industry Made the Raw Material of Many Others, by G. H. Brother; Glues and Gelatins, by R. H. Bogue; Paints, Varnishes, and Colors, by H. A. Gardner; Portland Cement—A Chemical Contribution to Modern Construction, by G. A. Rankin; Rayon—Man-made Silk, by M. G. Luft; Chemistry in Refrigeration, by F. G. Keyes; Soap—Cleanliness Through Chemistry, by M. H. Ittner; and The Relation of Chemistry to Water Supplies, by W. W. Skinner.

The purification of phosphoric acid by crystallization, W. H. ROSS, R. M. JONES, and C. B. DURGIN (*Indus. and Engin. Chem., 17 (1925), No. 10, pp. 1081–1083, figs. 2*).—In continuing previously noted experiments on the preparation of phosphoric acid from phosphate rock by the volatilization method (E. S. R., 36, p. 805), it was found that with the use of the Cottrell precipitator the concentration of the acid could easily be regulated by adjusting the flow of air through the furnace or changing the temperature of precipitation. At a temperature of 100° C. the greater part of the acid crystallizes on cooling to orthophosphoric crystals, which can be separated from the mother liquor by centrifugation. Sirupy phosphoric acid of 85 per cent concentration can be made to crystallize by cooling below 10° and inoculating with a hydrated crystal or by concentrating below 100° to a specific gravity of about 1.85 and inoculating in the same way. To obtain the conditions most favorable for the greatest yield of the crystalline acid for purposes of purification, solubility curves have been developed for hydrated and anhydrous orthophosphoric acid at different temperatures and data obtained on the percentage yield of crystals given by supersaturated solutions of different concentrations. These have been made use of in the development of a technique for the purification of C. P. sirupy and ordinary commercial phosphoric acid essentially as outlined above.

Freezing points of glycerol and its aqueous solutions, L. B. LANE (*Indus. and Engin. Chem., 17 (1925), No. 9, p. 924, fig. 1*).—A table is given of the freezing points of glycerol-water mixtures in varying proportions from 0 to 100 parts of each. The values recorded as freezing points were the tempera-

tures at which crystals first appeared and continued to grow. For the more concentrated solutions it was found necessary to seed the solution to avoid supersaturation. For the extremely low temperatures, the lowest being −46.5°C. for a mixture of 66.7 parts by weight of glycerol and 33.3 of water, refrigeration with carbon dioxide snow was used. A solution containing 56 per cent glycerol by weight was sealed in a glass capsule and cooled to −72° without breaking the tube, showing that at this concentration, which is commonly used in automobile radiators, there is no expansion.

Acetone by distillation of wood with lime, A. W. SCHORGER (*Indus. and Engin. Chem., 17 (1925), No. 9, p. 944*).—Data are tabulated on the yield of acetone from wood, modified cellulose, and starch by distillation with four parts of lime. The minimum and maximum yields in percentage by weight were 0.81 per cent for oxycellulose and 2.34 per cent for starch. In general, the yield was of the order of 2 per cent.

A nonstratifying carbon disulfide emulsion, W. E. FLEMING (*Indus. and Engin. Chem., 17 (1925), No. 10, p. 1087*).—A carbon disulfide emulsion which can be diluted without stratification to concentrations suitable for use as an insecticide at the roots of plants can be prepared as follows:

Dissolve an excess of potassium hydroxide in alcohol, filter off the insoluble carbonate, and add to the filtrate sufficient alcohol to obtain a concentration of 13.5 gm. of potassium hydroxide per 193 cc. of alcohol. To every 193 cc. of the solution add 77 cc. of oleic acid, and to every 270 cc. of the oleic acid-alcohol solution add 700 cc. of carbon disulfide and 30 cc. of cottonseed oil. The resulting mixture is said to be amber-colored and transparent and to remain homogeneous for at least six months. In preparing water dilutions an initial dilution should first be made with an equal volume of water before mixing with the larger amount of water.

Sulfite liquor as a protective colloid, E. C. BINGHAM, G. F. ROLLAND, and G. E. HILBERT (*Indus. and Engin. Chem., 17 (1925), No. 9, pp. 952, 953*).—Sulfite liquor purified by boiling to expel sulfur dioxide and by adding sodium or potassium carbonate to precipitate calcium and magnesium is suggested as of value as a protective colloid in producing emulsions, suspensions, foams, etc., with various materials, and as a lubricating agent.

Proteins of the cottonseed, D. B. JONES and F. A. CSONKA (*Jour. Biol. Chem., 64 (1925), No. 3, pp. 673–683*).—Cottonseed meal prepared from finely ground hull-free cottonseed kernels of the Lone Star variety by extraction with benzene followed by ether were analyzed for proteins by methods used in previous protein studies from the same laboratory.

As was true of the other seeds, the cottonseed meal yielded on extraction with sodium chloride two globulins, α-globulin and β-globulin, the former being precipitated by the addition of ammonium sulfate to from 0.4 to 0.5 saturation and the latter at a saturation of from 0.7 to 0.8 after the extract had been diluted with water. The yields of the two globulins were 2.59 and 16.00 per cent and the coagulation temperatures from 95 to 97° C. and from 92 to 93°, respectively.

By heating the sodium chloride extract to 62 and 85°, two preparations were obtained which were practically identical in composition and were characterized by high content of ash, 68.2 and 67.52 per cent, respectively. The ash had the following composition: P_2O_5 57.29, CaO 9.71, MgO 16.62, and Na_2O 13.9 per cent. A small quantity of a substance having the properties of glutelin was isolated, also a pentose protein containing 16.57 per cent of pentose, 0.194 per cent of phosphorus, and 12.64 per cent of nitrogen.

The distribution of the nitrogen as determined by the Van Slyke method in the α-globulin, β-globulin, and pentose protein is, respectively, as follows: Amide N, 11.40, 11.70, and 12.99 per cent; humin N, 1.66, 1.87, and 4.62; cystine N, 0.54, 0.51, and 1.43; arginine N, 22.90, 23.94, and 23.02; histidine N, 5.27, 6.15, and 3.09; lysine N, 4.07, 4.36, and 8.54; amino N of filtrate, 51.53, 50.11, and 43.93; and nonamino N of filtrate, 2.58, 1.90, and 1.03 per cent.

Proteins of the bark of the common locust tree, Robinia pseudacacia.—I, Enzymes associated with the proteins: The composition, properties, nitrogen distribution, and some of the amino acids of the albumin, D. B. Jones, C. E. F. Gersdorff, and O. Moeller (*Jour. Biol. Chem., 64 (1925), No. 3, pp. 655–671*).—In view of recorded instances of poisoning from ingestion of the bark of the locust tree, *R. pseudacacia*, and of the toxic properties of the proteins isolated from the bark, the authors have undertaken a systematic investigation of the proteins and other nitrogenous constituents of the bark. The present paper is concerned with the quantitative separation of the nitrogenous constituents from the air-dried inner bark of the locust tree and the analysis of one of the proteins isolated, the albumin.

Calculated on a moisture-free basis, from the inner bark containing 2.8 per cent of nitrogen, 2.52 per cent of an albumin and 1.38 per cent of a globulin were obtained, together with a significant quantity of a substance having the properties of a proteose and a small quantity of an unidentified low-coagulating protein. Evidence was obtained of the absence of proteins of the prolamin or glutelin type. The crude protein before separation showed the presence of enzymes capable of decomposing amygdalin and urea. These proved to be associated solely with the globulin.

The albumin isolated and examined by the methods generally used was found to have the following average composition: Percentage composition, C 54.52, H 6.83, N 14.77, and S 0.80; percentages of basic amino acids by the Van Slyke method, arginine 4.39, histidine 1.74, lysine 5.45, and cystine 1.37; percentages of amino acids by colorimetric estimations, cystine 1.03, tyrosine 6.27, and tryptophane 4.18; and aspartic and glutamic acids by direct isolation, 7.72 and 4.48 per cent, respectively.

The volatile constituents of Valencia orange juice, J. A. Hall and C. P. Wilson (*Jour. Amer. Chem. Soc., 47 (1925), No. 10, pp. 2575–2584*).—A chemical study of the volatile constituents of Valencia orange juice is reported in detail, with charts showing the scheme of separation of the various constituents from the original juice, chiefly by distillation and cohobation.

A total of 39,085 liters of juice yielded 182 gm. of oil, equivalent to about 4.4 parts per million of the juice by weight. The following constituents were identified in the oil: Ethyl alcohol, acetone, acetaldehyde, formic acid, an olefin alcohol ($C_{10}H_{18}O$), an amyl (probably isoamyl) alcohol, phenylethyl alcohol, and esters of formic, acetic, and caprylic acids. Geraniol and terpineol were thought to be present, but were not positively identified.

The non-volatile organic acids of alfalfa, W. A. Turner and A. M. Hartman (*Jour. Amer. Chem. Soc., 47 (1925), No. 7, pp. 2044–2047*).—The nonvolatile organic acids of green alfalfa plants have been isolated as the hydrazides and identified as citric, malic, and malonic acids. Of these, citric acid is present in largest quantity, malic in about two-thirds the amount of citric, and malonic in about one-fourth that of the citric.

Fermentation products of certain mannitol-forming bacteria, H. R. Stiles, W. H. Peterson, and E. B. Fred (*Jour. Biol. Chem., 64 (1925), No. 3, pp. 643–654*).—This paper supplements earlier studies from the same laboratory (E. S. R., 43, p. 610) on the fermentation products of the mannitol-fermenting bacteria.

Forty pure cultures of these bacteria were obtained from fermenting cereal infusions, and of these four were selected for special study on account of differences in their ability to ferment pentoses. The principal reactions with these were as follows:

Of the pentoses, culture 26 fermented xylose and arabinose, culture 19 only arabinose, culture 36 only xylose, and culture 23 neither xylose nor arabinose. Of the other carbohydrates, fructose was completely fermented by all of the strains with the formation of lactic and acetic acids, carbon dioxide, and mannitol. Sucrose was fermented by all of the strains with the production of small amounts of mannitol in all but one case. Raffinose was partly destroyed by cultures 26 and 36 with the production of lactic and acetic acids, alcohol, carbon dioxide, and mannitol. Glucose, galactose, and lactose yielded the same fermentation products (ethyl alcohol, carbon dioxide, and lactic acid), but glucose was fermented much more readily than the other two.

The lactic acid produced in all the fermentations was chiefly inactive. Culture 36 proved capable of fermenting calcium lactate with the production of volatile acid, and of destroying mannitol with the production of lactic and acetic acids, and probably carbon dioxide.

The organisms used are described as Gram-positive rods, nonmotile, nonsporeformers, and catalase-negative. They do not liquefy gelatin, grow best at lowered oxygen tension, and have a thermal death point of between 60 and 70° C. in a neutral medium. All but culture 26 produce acid and form curd from milk, and all reduce methylene blue. Culture 36 has the most rapid reducing power of any of the organisms tested.

Adjustment of pH of culture media under sterile conditions, L. M. Christensen and E. I. Fulmer (*Indus. and Engin. Chem., 17 (1925), No. 9, p. 935, fig. 1*).—An apparatus for adjusting the H-ion concentration of culture media under sterile conditions is described and illustrated, with detailed directions for its use.

A simple electric water still, R. W. Gelbach (*Indus. and Engin. Chem., 17 (1925), No. 10, p. 1050, fig. 1*).—The apparatus, which can be operated on the ordinary 110-volt alternating current, consists of a Pyrex balloon flask connected, by means of a fractionating column, with a block tin condenser leading into a receiving bottle. The condenser may be made by bending a piece of 3/8-in. block tin pipe to connect with the still head and passing it through an ordinary glass condenser jacket. The heating element is a 20-ohm coil of No. 24 nichrome wire, the ends of which are attached to heavy copper leads passing through the rubber stopper. The coil is immersed in a solution of alkaline permanganate. It is said that with a solution containing about 750 mg. of potassium hydroxide and 200 mg. of potassium permanganate per liter, the water is distilled at the rate of about 2 liters an hour.

A simplified respiration apparatus [trans. title], H. Schadow (*Klin. Wchnschr., 4 (1925), No. 32, pp. 1548, 1549, figs. 2*).—The apparatus described, which is said to give results within 2 per cent of those obtained with the more elaborate forms of the Benedict apparatus, consists only of a spirometer with suitable connections with the mouthpiece for the subject.

The oxy-calorimeter: Principle and application to the determination of energy values of fuels, foods, and excretory products, F. G. Benedict and E. L. Fox (*Indus. and Engin. Chem., 17 (1925), No. 9, pp. 912–918, fig. 1*).—The principle of the oxy-calorimeter is "the direct determination of the volume of oxygen required to burn a known weight of the substance, and the use of this measurement in the estimation of the heat value of these substances by

means of a series of directly determined factors giving the calorific value of a liter of oxygen."

The form of apparatus which is used for measurements with a high degree of accuracy is described in detail and illustrated by a diagram. The essential parts of the apparatus include a combustion chamber consisting of a glass lamp chimney sealed in water in a brass cup holding a small tripod for the nickel crucible in which the combustion takes place, a carbon dioxide absorbing vessel, a blower to circulate the air current, a spirometer for measuring the contraction of the volume of oxygen used, and a cooling system consisting of a pipe immersed in a pail of water and ice. Detailed directions are given for the manipulation of the apparatus and its use in standardization experiments by the combustion of pure sucrose, lactose, benzoic and salicylic acids, and pure nitrogenous substances and in determinations of the energy value of various fuels. The standardization data indicate that the apparatus measures the oxygen required to oxidize completely 1 gm. of any of the substances tested to within 1 per cent of the theoretical amount. The fuels tested included anthracite and bituminous coal, fuel oil, and coke. In all cases the results obtained were well within the limits of accuracy of sampling.

For the determination of the energy value of foods, feeding stuffs, and excreta, which involve much greater errors in sampling, a simpler form of oxycalorimeter involving the use of any standardization apparatus of the closed-circuit type is recommended.

Data are tabulated on the calorific value, expressed as calories per liter of oxygen, of various substances including pure organic substances (especially commonly metabolized compounds), fuels, human and animal excreta, and foods classified as high carbohydrate substances, highly nitrogenous substances, fats, and mixed foods. The carbohydrates tested, including sucrose, lactose, starch, and dextrose, had values close to 5.04. Lactic acid, acetone, β-oxybutyric acid, and ethyl alcohol were close to 4.85, human and animal fats 4.75, and highly nitrogenous substances 4.68. The average value 4.825 is considered to be not far from correct for all food mixtures.

Spectrophotometric determination of hydrogen-ion concentrations and of the apparent dissociation constants of indicators.—IV, 1-napthol-2-sodium sulfonate indophenol, W. C. Holmes and E. F. Snyder (*Jour. Amer. Chem. Soc., 47 (1925), No. 8, pp. 2232–2236, fig. 1*).—In this continuation of the series of studies previously noted (E. S. R., 53, p. 714), the apparent dissociation constant for 1-naphthol-2-sodium sulfonate indophenol in aqueous solution containing 5 per cent of alcohol was found to be 8.63. The dissociation of the dye was found to follow the normal course of a monobasic acid. Data are given for the application of this indicator to the determination of H-ion exponents by the spectrophotometric and drop-ratio methods.

The use of the quinhydrone electrode for hydrion concentration determination on serum, G. E. Cullen and E. Biilmann (*Jour. Biol. Chem., 64 (1925), No. 3, pp. 727–738, figs. 2*).—A technique which has been found to yield satisfactory results in the determination of the H-ion concentration of blood serum with the use of the quinhydrone electrode is described in detail. Whole blood and serum containing traces of hemoglobin can not be used for the determination.

Improved tube for determination of decolorizing value of soils, D. V. Moses and J. H. Griffith (*Indus. and Engin. Chem., 17 (1925), No. 9, p. 901, figs. 2*).—This is a modification of the tube usually used in the Lord method of determining the decolorizing value of soils by the weight of a standard dye

absorbed by a given amount of soil. The modified tube is made from an ordinary 13-cm. two-bulb calcium chloride tube, the lower bulb of which is replaced by a tube of 3 mm. inside diameter sealed to the tube just below the bulb. The end of this tube is slightly drawn out and a piece of glass tubing large enough to fit loosely over the end is constricted just enough to fit closely over a small piece of filter paper which has been placed over it as a cap. While the tube is in a nearly horizontal position a 0.2-gm. sample of the soil is introduced into the bulb and sufficient dye added for coagulation of the soil. The tube is revolved at intervals of 5 or 10 minutes until the coagulation is complete, after which it is placed in the neck of an Erlenmeyer flask and allowed to drain. The flask is then weighed on a rough balance, the bulb filled with dye and allowed to drain until a color appears in the lower tube, and the flask again removed and weighed.

The chief advantages claimed for the modified tube are that it does away with the graduated funnel and stopcock, and is of simple construction and manipulation and not so easily upset as the Lord tube.

Detection of diethylphthalate, S. LEVINSON (*Indus. and Engin. Chem., 17 (1925), No. 9, p. 929*).—A modified resorcinol method for detecting diethylphthalate in ethyl alcohol, which is said to give reliable results in positive as well as in negative cases and to be applicable to mixtures containing not only diethylphthalate but also phthalic acid, is described essentially as follows:

Ten cc. of the material is evaporated nearly to dryness over an open flame, 1 gm. of boric acid is added and the evaporation continued to dryness, and finally 1 gm. of resorcinol is added and the mixture heated until it becomes sticky and almost dry. The melted mass is cooled, dissolved in about 50 cc. of water, transferred to a tall glass cylinder, and made alkaline with sodium hydroxide. The development of a fluorescence indicates a positive test. If the method is used to detect phthalic acid and its salts, blank tests should be run and also comparative tests with diethylphthalate.

The color grading of honey, E. L. SECHRIST (*U. S. Dept. Agr., Dept. Circ. 364 (1925), pp. 8, fig. 1*).—The author discusses the requisites of a standard grader, describes a grader officially adopted by the Office of Bee Culture Investigations of the Bureau of Entomology and the Bureau of Agricultural Economics for the color grading of honey, and gives instructions for grading. The future development of graders is also briefly discussed.

Soft sugar color standards, H. I. KNOWLES (*Indus. and Engin. Chem., 17 (1925), No. 9, p. 980*).—The standards described are made from coarse granulated sugar colored with various powdered pigments and mixed with sufficient Russian oil to give the mixture the characteristic soft sugar appearance. A large quantity of colored sugar is first prepared, as a basis of a set of standards, by trial additions from weighing tubes of suitable pigments to a mixture of deeply colored sugar, white sugar, and Russian oil. From this a set of standards is prepared by diluting a known quantity with a weighed amount of white sugar and a definite volume of Russian oil. Among the pigments suitable for combination in preparing the standard are light and medium chrome yellow, yellow ocher, raw umber, and ultramarine.

It is stated that standards thus prepared have been kept in square-faced glass bottles with metal caps for more than six months with no more alteration than a very slight reddening in color. Suggested uses for the standard are as a guide in centrifuging soft sugar skips and for recording the color of different lots of soft sugar as manufactured.

Ten years of sugar refining, L. A. WILLS (*Indus. and Engin. Chem., 17 (1925), No. 10, pp. 1028, 1029*).—This is chiefly a review of the progress which

has been made in the past ten years in methods and equipment in the sugar refining industry.

Sugar-cane sirup manufacture, compiled by H. S. Paine and C. F. Walton, jr. (*U. S. Dept. Agr. Bul. 1370* (*1925*), *pp. 76, figs. 19*).—This publication is a compilation of papers by various contributors on different phases of sugar cane sirup manufacture as follows: Influence of Cultural Conditions on Quality and Yield of Sirup, by P. A. Yoder (E. S. R., 49, p. 230); Considerations Governing Size of Sirup Plant, by C. F. Walton, jr.; Equipment and Costs for Making Sirup on a Small Scale, by M. A. McCalip and C. F. Walton, jr.; Comparison of Methods of Manufacture—Boiling and Skimming Method by M. A. McCalip and C. F. Walton, jr., Clarification by Sulphur Dioxide and Lime by C. E. Coates and W. G. Taggart, and Clarification by Lime Alone, Mechanical Clarification, superseding Bulletin 921, previously noted (E. S. R., 44, p. 206), and Treatment with Decolorizing Carbons, all by C. F. Walton, jr.; Equipment and Costs for Making Sirup on a Large Scale, by L. J. Lassalle and J. J. Munson; Canning Sirup—Operation by W. L. Owen, and Cans and Canning Equipment by C. F. Walton, jr.; Prevention of Crystallization by the Invertase Process, by H. S. Paine and C. F. Walton, jr.,; Composition and Food Value of Cane Sirup, by H. S. Paine; and Marketing Cane Sirup, by H. S. Paine and C. F. Walton, jr.

The estimation of pectin and a study of the constitution of pectin, C. F. Ahmann and H. D. Hooker (*Missouri Sta. Research Bul. 77* (*1925*), *pp. 5–39, figs. 5*).—The literature on pectin, particularly on clarification and methods of determination, is reviewed and discussed, methods are described for the determination of protein and the estimation of the number of carboxyl groups in pectic acid, and a study is reported of the separation of the hydrolysis products of pectin for the purpose of obtaining information concerning the structure of pectic acid.

The method of determining pectin depends upon the titration of the acidity produced on saponification with sodium hydroxide. The technique adopted after a study of the effect upon the reaction of temperature and length of time of saponification is as follows: To pectin solutions containing from 0.25 to 1 gm. in 200 cc. of solution an amount of sodium hydroxide sufficient to make the concentration about one-tenth normal is added from a pipette, the solutions are made up to volume (250 cc.), sealed to prevent the entrance of carbon dioxide, and allowed to stand at 55° C. for 12 hours, after which aliquots are pipetted off and titrated with standard hydrochloric acid, which should be only about one-fourth as concentrated as the sodium hydroxide. Taking the neutral equivalent of pectic acid at 55° as 194.9, equivalent to 208.9 gm. of pectin, the amount of pectin is calculated from the proportion 40 (molecular weight of sodium hydroxide) : 208.9=weight of alkali combined : X. A comparison of this method with the gravimetric procedure of Carré and Haynes (E. S. R., 47, p. 610) with a known pectin solution gave results approximating the correct value as closely as those of the gravimetric method. It is thought that in working with plant materials containing salts and which are occluded by calcium pectate gel the titration method is more accurate as well as being more rapid.

In the attempt to determine the number of carboxyl groups in pectic acid, equivalent portions of pectic acid solutions with separate portions of alkali of 0.5 cc. and increasing multiples up to the entire amount required for complete neutralization were allowed to stand in sealed flasks for 12 hours, at the end of which the pH value of each solution was determined with the Bovie H-ion potentiometer. The curves of the values thus obtained showed 11 breaks at

different points, each indicating a salt of definite pH value representing a carboxyl group. The composition of pectic acid as determined by standard combustion methods indicated, however, an acid of 12 carboxyl groups. Assuming 11 free carboxyl and 1 unsaponified group the molecular weight of pectic acid would be 2,138.

From a study of the hydrolysis products of pectin with concentrated hydrochloric acid at different temperatures and for different lengths of time, the conclusion is drawn that the nucleus of pectic acid is a dibasic acid, galacturonic-galactonic acid,

$$(COOH)O_3H_7C_6\left\langle {O \atop O} \right\rangle C_5H_9O_3(COOH).$$

At least 6 of these nuclei are linked together to form pectic acid.

An extensive list of literature references is appended.

The manufacture of pectin, C. P. Wilson (*Indus. and Engin. Chem., 17 (1925), No. 10, pp. 1065–1067*).—This paper reviews briefly the literature on pectin manufacture, and describes in detail the patented method of the author and his coworkers for the manufacture of pectin from the lemon refuse from citric acid manufacture by precipitation with ammonia and aluminum sulfate. This precipitation is explained on the theory that pectin is a colloid of the emulsoid or lyophyllic type, carrying a negative charge, and is consequently precipitated along with the aluminum hydroxide, carrying a positive charge, formed by the action of ammonia on aluminum sulfate. The aluminum hydroxide is removed from the pectin by suspending the impure dried pectin in 85 per cent alcohol containing about 10 per cent by volume of concentrated hydrochloric acid, which dissolves the aluminum hydroxide but not the pectin. The final product is said to be a grayish powder, neutral in color and flavor, and capable of carrying from 140 to 220 times its own weight of sugar.

A bibliography of 31 titles is appended.

Systematic survey of rubber chemistry, C. W. Bedford and H. A. Winkelmann (*New York: Chem. Catalog Co., 1923, pp. 385, fig. 1*).—This is chiefly an exhaustive bibliography on rubber chemistry, covering the literature up to January 1, 1923, and arranged by author index, subject index, and patent index. In the first the authors are listed alphabetically, with their works in approximate chronological order, cross-referenced with the subject and patent indexes. The subject index is arranged in alphabetical order, with brief abstracts indicating the nature of the work. The patent index is arranged numerically, with cross references to the author index.

The volume also contains an introduction by W. C. Geer and chapters on organic accelerators of vulcanization, by L. B. Sebrell, and theories of vulcanization, by W. J. Kelley.

METEOROLOGY

Correlation in seasonal variations of weather.—IX, A further study of world weather. X, Applications to seasonal forecasting in India, G. T. Walker (*Indian Met. Dept. Mem., 24 (1924), pts. 9, pp. 275–332; 10, pp. 333–345*).—Continuation is reported of the author's studies, previously noted (E. S. R., 50, p. 510), of world weather, with special reference to forecasting seasonal and regional rainfall in India. The first paper deals with the influence of certain world centers of action, the second with applications to seasonal forecasting in India.

An effort is made to trace "the relationships between the conditions at the most important 'centers of action' or strategic points of the world's weather, and among these have been included not only the centers of quasi-permanent 'highs' and 'lows' but also regions where pressure, rainfall, or temperature is of widespread influence." Many of the correlations reported appear to support the view "that seasonal forecasting is capable of wider application than at present."

World meteorology and long-range forecasting (*Nature* [*London*], *116* (*1925*), *No. 2915*, *pp. 413, 414*).—This is a review of the studies noted above.

The extremes of the climatic elements of the earth [trans. title], G. HELLMANN (*Naturwissenschaften*, *13* (*1925*), *No. 41*, *pp. 845–853*).—The extremes, and where they occur, of temperature, moisture, cloudiness, precipitation, and winds, as far as reliable observations now available show, are summarized. The following tentative limits are given: Annual average temperature −25.8° C. (−14.44° F.) to 30.2° C. (86.36° F.), monthly mean −51.2 to 38.9°, annual range 0.4 to 66.3°, absolute extremes −68 to 56°, annual mean of vapor pressure 0.9 to 25 mm., annual mean of relative humidity 28 to 90 per cent, monthly mean of relative humidity 13 to 95 per cent, annual mean cloudiness 0.5 to 9, annual mean precipitation less than 1 to 12,655 mm., monthly mean precipitation 0 to 2,852 mm., average number of rainy days per year less than 1 to 336, average number of rainy days per month 0 to 30 (31), and average number of stormy days per year 0 to 214.

Meteorological observations at the Massachusetts Agricultural Experiment Station, J. E. OSTRANDER and J. BOWER, JR. (*Massachusetts Sta. Met. Buls. 441–442* (*1925*), *pp. 4 each*).—Summaries are given of observations at Amherst, Mass., on pressure, temperature, humidity, precipitation, wind, sunshine, cloudiness, and casual phenomena during September and October, 1925. The data are briefly discussed in general notes on the weather of each month.

Weather observations, J. B. THOMPSON (*Virgin Islands Sta. Rpt. 1924*, *pp. 1, 8, 9*).—Observations on temperature, precipitation, evaporation, and wind at the Virgin Islands Experiment Station during the year ended June 30, 1924, are summarized. The highest temperature recorded was 91° F., August 13 and 16 and September 6; the lowest 58°, December 4. The precipitation was 35.44 in., 7 in. higher than that of the previous year, but still below normal. The heaviest rainfall in 24 hours was 4.25 in. October 16. The evaporation was 81.8 in.

The moisture belts of North America, E. McDOUGALL (*Ecology*, *6* (*1925*), *No. 4*, *pp. 325–332*, *pl. 1*, *figs. 2*).—Using mean annual figures of temperature as abscissas and of precipitation as ordinates, the author draws curves dividing the climate of North America into moisture belts corresponding to thermal zones which agree in their major features with the principal types of vegetation. Five moisture belts are defined and charted, (1) arid, which is typically desert, (2) semiarid, semidesert, (3) semihumid, grassland, (4) humid, forest, and (5) wet, supporting forests of peculiar type, distinguished by remarkable luxuriance of growth. It is stated that "grasses are favored by summer rainfall; where summer is the wet season they flourish in the semiarid belt and tend to invade the humid belt, apparently with the assistance of fire. Winter rainfall is of little use to most types of vegetation, but it seems to be utilized by the evergreen conifers. Woodlands and forests composed of these species occur in four of the five moisture belts in the winter-precipitation region in different degrees of luxuriance." Attention is also called to the fact that "topographic and edaphic conditions also affect the moisture supply and modify the distribution of vegetation."

A study of the rainfall régime of Morocco [trans. title], A. JURY and G. DEDEBANT (*Mém. Soc. Sci. Nat. Maroc, No. 9 (1924), pp. 18, pls. 2, figs. 2*).—The available data, covering in a few cases 30 years but in most cases 10 years, are summarized with reference to character and origin of rainfall, the influence of relief on distribution, seasonal distribution, and hail. The rainfall data are embodied in a provisional chart of rainfall distribution.

It is shown that there is a sharply defined succession of rainy and dry periods due to the influence of the tropical zone; a diversity of the rainfall régime due to proximity of two fronts of discontinuity, the polar front, and the trade winds; and the marked influence of differences in elevation on distribution. The rainy period extends from October 15 to April 15, the dry from April 15 to October 15. Rainfall maxima occur in November and March. The winter rainfall is generally interrupted by a period of fine, clear weather of several weeks' duration in December and January. A very dry period occurs between June 15 and September 15. The rainfall decreases in a general way from north to south, more strictly from northwest to southeast. There is a marked increase in rainfall in the region of the Atlas Mountains and other more elevated portions of the country.

Influence of climate on the more important fruits [trans. title], E. WEINKAUTNER (*Gartenwelt, 29 (1925), Nos. 35, pp. 595–597; 36, pp. 612, 613; 37, p. 630; 38, pp. 643, 644*).—This is a general discussion of the subject applying especially to middle European conditions.

SOILS—FERTILIZERS

Short review of the activities of the soils section of the agricultural experiment station at Groningen from May 1, 1916, to May 1, 1923 (*Kort Verslag van de Werkzaamheden van de Bodemkundige. Afdeeling van het Rijkslandbouwproefstation Groningen over het Tijdvak 1 Mei, 1916, tot 1 Mei, 1923. Groningen: Hoitsema Bros., [1924], pp. 30*).—The soils work at the station during the period dealt with the adsorption phenomena of soils, soil acidity, classification of mineral soils, and chemical studies of prevailing soil types.

Johnson County soils, R. S. SMITH, E. A. NORTON, E. E. DETURK, F. C. BAUER, and L. H. SMITH (*Illinois Sta. Soil Rpt. 30 (1925), pp. [2]+46, pl. 1, figs. 7*).—This survey deals with the soils of an area of 215,040 acres in southern Illinois. The topography is generally rough and hilly, and with the exception of broad swamps and bottomlands, the county is well drained.

The soils are grouped as upland timber, residual, and swamp and bottomland soils. Seven soil types are mapped, of which the yellow silt loam and yellow-gray silt loam upland timber soils and the deep gray silt loam swamp and bottomland soil cover 61.6, 13.15, and 12.94 per cent of the area, respectively. Analyses are also reported, together with data on the fertilizer requirements and crop adaptations, of the prevailing soil types.

Appendixes on the interpretation of the soil survey and on the principles of soil fertility are included, together with a supplement containing data from four experimental fields.

General presence of nickel and cobalt in arable soil [trans. title], G. BERTRAND and M. MOKRAGNATZ (*Ann. Sci. Agron. Franç. et Étrang., 42 (1925), No. 3, pp. 167–171*).—Analyses of several samples of cultivated soils from France and other European countries are briefly reported, showing that nickel and cobalt exist not only in all the French soils examined but in soils from Germany, Denmark, Italy, Rumania, and Serbia. The contents of these metals are not high but are not negligible.

Influence of electrolytes on the total surface of soil elements [trans. title], L. SMOLIK (*Compt. Rend. Acad. Sci.* [*Paris*], *179* (*1924*), *No. 3, pp. 211–213*).—Studies are reported which led to the conclusion that the extent of the surface of soil particles depends upon the temperature to which the soil has been exposed. It is generally less the higher the temperature. It was found that air-dried soils lose from 11 to 15 per cent of their total surface. Drying at 50 and 100° C. (122 and 212° F.) caused the soils to lose, in addition, from 0.7 to 5.6 per cent of their surface. Complete desiccation reduced the surface of mineral soils one-fifth and of peat two-fifths. Heat had a greater coagulating influence on humus than on inorganic colloids.

Intermittent frost was found to have only a slight influence in diminishing the surface of air-dried soil. On the contrary, it increased the snrface of saturated soil by 4 per cent. The removal of electrolytes from soil by sufficiently prolonged washing caused a renewal of the hydrogel state of the soil and increased the hygroscopicity 10 per cent. On the other hand, increasing the salt content of the soil diminished its total surface.

Clays as soil colloids, A. F. JOSEPH (*Soil Sci.*, *20* (*1925*), *No. 1, pp. 89–94*).—In a contribution from the Wellcome Tropical Research Laboratories, Khartum, studies are reported in which repeated centrifuging in a supercentrifuge and shaking of clay suspensions showed that practically the whole of a clay fraction may be obtained in the colloid condition. A certain correlation was found between the physical and chemical properties and the chemical composition of clays.

Hygroscopicity in comparison with grain distribution and specific surface of grains [trans. title], N. LIATSIKAS (*Internatl. Mitt. Bodenk.*, *14* (*1924*), *No. 3–6, pp. 146–154, fig. 1*).—Studies are reported which showed that neither mechanical analysis of soils nor the determination of hygroscopicity completely discloses the condition of soils, and that neither can displace the other in this connection. The mechanical analysis indicates the distribution of different soil particle sizes and therefore has a bearing on all related properties. However, it is held that a correct indication of the mechanical composition of soil can be obtained only by a combination of mechanical analysis and hygroscopicity determination.

The soil solution.—I, Methods for obtaining and investigating soil solutions [trans. title], A. G. DOĬARENKO (*Nauch. Agron. Zhur.* (*Jour. Landw. Wiss.*), *1* (*1924*), *No. 9–10, pp. 577–586*).—An oil emulsion method of extraction of soil solutions is described, in which a sample of fresh field soil is mixed with a known quantity of oil until it is completely emulsified with the soil solution, after which the emulsion is extracted by pressure. The examination of soil solutions obtained in this manner is discussed.

Studies on the variations of soil solutions during the vegetation period in differently cultivated fallow fields [trans. title], A. V. TROFIMOV (*Nauch. Agron. Zhur.* (*Jour. Landw. Wiss.*), *1* (*1924*), *No. 9–10, pp. 587–613*).—Physical and chemical studies of the solution of fallow soils during wet and dry summers showed that the composition of the solution varied widely, depending upon the manner of cultivation. The concentration of the soil solution increased up until the middle of the vegetation period and then decreased. In fallow soils the variations in concentration were much more marked than on recently plowed fallow soils.

The osmotic pressure of the soil solution reached its maximum during the vegetation period, but this maximum was from four to five times greater in straight fallow soils than in recently plowed fallow or in cropped soils. The same was true as regards nitrate content.

The ratio of calcium content to potassium content varied in accordance with the condition of the soil, whether cropped or fallowed, and with the fertilizer treatment. The H-ion concentration varied considerably with the time at which samples were taken, and with the manner of cultivation of the soil.

Saturation of soil: (a) Mineral soils (clay soils) [trans. title], D. J. HISSINK (*Ztschr. Pflanzenernähr. u. Düngung, 4 (1925), No. 3, Wiss., pp. 137–158, figs. 3*).—Methods are described for determining the saturation capacity and degree of saturation of soils, and the results of a number of such determinations are reported and discussed with reference to their bearing on the state of flocculation of the soil colloids, soil reaction, and lime requirement. A close relationship is indicated between the degree of saturation of soils and the proportion of replaceable calcium present.

Soil water of the New Jersey coast, A. P. KELLY (*Ecology, 6 (1925), No. 2, pp. 143–149*).—Studies conducted at Rutgers University are reported, in which it was found that the sea beach is saline only under the influence of the surf, and that fresh soil water may be found even under the dunes. Plants of the strand then are not all halophytes, but are to be considered as adapted to coast conditions. Plants of the front and littoral beaches are halophytes, while dune plants constitute a special group of xerophytic psammopbytes.

While the ground water of the front beach is alkaline, it quickly becomes acid on the landward side, changing rather rapidly upon coming into a region presenting a different physicochemical complex. The local reaction is caused largely by local conditions. In dune soils the reaction curve proceeds steadily from acid to less acid, whereas these soils, where humus is present in an appreciable amount, exhibit the depressed curve of most inland soils.

With reference to reaction, it is thought that some plants may have become accustomed, through long periods of subjection, to certain limits, but this range of reaction is apparently a limiting factor only as it is taken in conjunction with other factors of the habitat.

Soil tank investigations, S. E. COLLISON (*Florida Sta. Rpt. 1919, pp. 43–45*).—Analyses of the drainage water from the eight soil tanks at the station are presented and briefly discussed (E. S. R., 39, p. 421). The injury to the trees by freezing in 1917 is said to be still apparent in the increased amount of plant nutrients appearing in the drainage water.

Investigations on soil acidity [trans. title], E. KNICKMANN (*Ztschr. Pflanzenernähr. u. Düngung, 5 (1925), No. 1–2, Wiss., pp. 1–92, figs. 8*).—Studies are reported which showed no approximate relation between degree of acidity and elevation of soils. Local conditions could promote strong acidity at any elevation, although the higher soils were found to be somewhat more inclined toward an acid reaction.

Acid mineral soils were found to possess a degree of acidity corresponding to their petrographic origin, which could be basically altered through the influence of humus. The influence of the humus content and its degree of decomposition on the active acidity was of the greatest importance, and was found to disappear as the humus content decreases with depth, so that soils of similar origin become similar in reaction.

It was found that where acidity occurs to a noteworthy degree the three forms, active acidity, hydrolytic acidity, and exchange acidity, usually occur simultaneously. Naturally moist soils showed different acidity phenomena than did air-dried soils. Dryness had little influence on exchange and hydrolytic acidities, but the active acidity was doubled after a week and quadrupled after six months. This was also caused by artificial drying by heating, the active acidity increasing steadily with increasing heat, until at

100° C. (212° F.) it was forty times that produced by air drying. This increase in active acidity was also proportional to the humus content of the soil. The active acidity began to decrease at 150°, and disappeared completely on ignition. The partially inorganic origin of the exchange and hydrolytic acidities was evidenced by their greater resistance to heat.

Liming was found to decrease soil acidity rapidly at first and then more slowly. As much lime was required to neutralize the last 10 per cent of acidity as was required for the first 90 per cent.

Methods for the determination of soil acidity are discussed.

Plant growth on acid soils [trans. title], H. KIRSTE (*Ztschr. Pflanzenernähr. u. Düngung, 5 (1925), No. 3, Wiss., pp. 129–194, figs. 23*).—Field experiments are reported which not only showed the strong influence of exchange acidity in soils on wheat, clover, and lucern, but indicated the dependence of crop growth on the degree of acidity. Oats appeared to be somewhat more resistant to this influence, while lucern appeared to be affected by hydrolytic acidity.

Experiments on light loamy sand soil showed that, while exchange acidity has some influence on oats, its complete correction is not necessary, since physiologically alkaline fertilization without lime produced better results with this crop than a physiologically acid fertilization with lime.

Tests on a loam soil of the susceptibility of a large number of crops to exchange acidity showed that no smaller yields of the highly susceptible crops were obtained by the use of physiologically acid fertilization, in amounts corresponding to field practice, than with no fertilization. However, characteristic symptoms of acid injury were evident, such as yellowing of barley, spotting of bush bean leaves, and leaf border changes of red clover, lucern, mustard, etc. Other crops assimilated the nutrients added by this fertilization without the correction of the soil acidity.

On the basis of these results, crops are divided into two groups in accordance with their susceptibility to exchange acidity. The susceptible crops are barley, beets, lucern, red clover, mustard, garden beans, wheat, and peas, while the unsusceptible crops are oats, serradella, corn, potatoes, and lupines. A comparison of the results with oats on light and heavy soils showed that a smaller degree of exchange acidity is required for injury in light soils than in heavy soils.

The unfavorable influence of exchange acidity was removed by treatment of some of the more susceptible crops such as barley, beets, and mustard, not only with calcium carbonate but also with soda. This is taken to indicate that the injurious action is not due to a lime deficiency but to the soil acidity. The addition of increasing quantities of physiologically acid fertilization increased the injury to barley.

Experiments with different fertilizer combinations showed that a physiologically alkaline fertilization increased the yield of barley more than did a physiologically acid fertilization. In the different combinations, Thomas meal and ammonium sulfate exercised the strongest influence on soil acidity and plant growth.

Experiments with lime led to the conclusion that one and one-half times the indicated lime requirement should be applied to susceptible crops such as mustard.

Nature, importance, and methods of determination of soil acidity [trans. title] (*Ztschr. Pflanzenernähr. u. Düngung, 4 (1925), No. 4, Wiss., pp. 215–238*).—This is a symposium on the subject and contains articles by B. Tacke, E. Ramann, O. Lemmermann, G. Hager, J. Hudig, H. Niklas, O. Nolte, D. J. Hissink, and R. Ganssen.

Importance of forms of acidity in soil for dissolving difficultly soluble phosphates [trans. title], H. KAPPEN and K. BOLLENBECK (*Ztschr. Pflanzenernähr. u. Düngung, 4 (1925), No. 1–2, Wiss., pp. 1–29*).—Studies are reported which showed that all three forms of humus acids, the neutral salt decomposing, the exchange, and the hydrolytic acids, are capable of decomposing tricalcium phosphate in aqueous suspensions. This action is due to the ability of these acids to combine with bases. Physical factors such as time and kind of contact of the acids and phosphate and the water quantity have a strong influence on this reaction.

The greatest phosphate decomposition takes place under the action of the neutral salt decomposing humus acids, followed in order by those taking place under the influence of the hydrolytic and exchange acidities.

The dissolving action of the three forms of acidity was found to be greater in potassium sulfate solution than in water, and the degree of phosphate decomposition increased with the concentration of the potassium sulfate solution. Solutions of other salts such as magnesium chloride, ammonium sulfate, ammonium nitrate, potassium nitrate, and potassium chloride had a similar effect. Similar results were obtained with raw phosphates under the influence of humus acids as were obtained with tricalcium phosphate, except that the total results of dissolution were relatively smaller.

Hydrolytically acid silicic acid was found to throw quite noteworthy quantities of phosphoric acid into solution from tricalcium phosphate in the presence of potassium sulfate. Exchangeable permutit and naturally exchangeable mineral soils were able to throw less phosphoric acid into solution from tricalcium phosphate than was pure water, in spite of the activating influence of potassium sulfate.

I, Main phases of the process of podsol formation. II, Relation of soil productivity to soil acidity, J. WITYN (*I, Die Hauptphasen des Podsolbildungsprozesses. II, Die Fruchtbarkeit des Bodens in Ihrer Beziehung zur Bodenacidität. Riga: A. Gulbis, 1924, pp. 32, figs. 5*).—These two papers, presented at the Fourth International Soil Congress at Rome in 1924, deal, respectively, with the main phases of the process of podsol formation, which are enumerated and discussed on the basis of studies of soil profiles; and with the relation of soil productivity to soil acidity on the basis of studies of the soils of Latvia.

Exchange of the aluminum ions of different soils with the potassium ions of neutral salts [trans. title], L. SMOLIK (*Compt. Rend. Acad. Sci. [Paris], 180 (1925), No. 23, pp. 1773–1776*).—Studies are reported which showed that the aluminum of podsol soils is readily displaced by the potassium of potassium chloride, especially that at a depth of from 25 to 70 cm. (9.8 to 27.5 in.), while soils of the redzina and chernozem types do not indicate any exchange of aluminum for the potassium of a neutral salt.

Hydrogen-ion concentration, buffer action, and soil type as a guide to the use of lime, C. R. RUNK (*Jour. Amer. Soc. Agron., 17 (1925), No. 6, pp. 345–353, figs. 3*).—Studies conducted at the Delaware Experiment Station to determine what relation, if any, exists between soil type and buffer action in soils, and whether this can be used in determining the proper lime applications, are briefly summarized.

From the standpoint of economy, lime applications made on the basis of the lime requirement method showed no profits in most instances. Since increases in production were secured, it is concluded that smaller applications based upon H-ion concentration and actual plant requirements would have been economical. It is further concluded that any method for determining the lime

requirement of a soil should take into consideration the buffer quality of the soil and the acidity value desired.

Buffer property of soil and its mechanism [trans. title], A. Demolon (*Compt. Rend. Acad. Agr. France, 11 (1925), No. 21, pp. 620–623*).—Studies are briefly reported which indicate that clay is the essential element of acidity in mineral soils, and that the clay complexes of soil tend to stabilize soil reaction due to their ability to absorb bases, especially lime. It is concluded that clay soils are those the reactions of which undergo the least variation under the influence of either caustic lime or sulfates.

To what soil depth can plants efficiently assimilate nutrients? [trans. title] O. Lemmermann, H. Wiessmann, and K. Eckl (*Ztschr. Pflanzenernähr. u. Düngung, 4 (1925), No. 6, Wirtschaft.-Prakt., pp. 233–241*).—Studies are reported which showed that plants are able to assimilate nutrient materials from rather deep soil strata in amounts sufficient to influence yields. This is taken to indicate that determinations of the nutrient content of surface strata are inadequate to indicate the potential nutrient supply of a soil. This is especially true for mineral soils, but does not hold to as great an extent for upland moor soils owing to the acid nature of the subsoils.

It has been generally found that the subsoils are not so well supplied with organic matter, nitrogen, phosphoric acid, and potash as the cultivated surface soils, and that lime usually exists in greater quantities in the subsoil. There are so many exceptions to this rule, however, as to indicate the importance of studying both surface and subsoils when determining the total nutrient supply of a soil.

Soil productivity and soil microbiological processes [trans. title], E. Mishustin and V. Sokolov (*Nauch. Agron. Zhur. (Jour. Landw. Wiss.), 2 (1925), No. 1, pp. 38–46*).—Studies are reported which showed that the numbers of soil bacteria as determined by the use of the customary nutritive media are no indication of the relation between the soil processes and its productivity. The microbiological processes of soil were found to have a somewhat complicated relation to productivity, since the higher and lower flora of the plant world were found to be cooperative in some instances and antagonistic in others.

The addition of lime with superphosphate increased crop yields, depressed ammonification, nitrification, and urea decomposition, and increased nitrogen fixation and denitrification. This is taken to indicate the possibility of depressing certain groups of bacteria and stimulating others by varying their living conditions. Both mineral and organic fertilization markedly increased the microbiological activity of soils. The increase caused by stable manure was not proportional to the crop yield, due possibly to the assimilation of nutrient materials by the bacteria.

Rapid formation of humus [trans. title], A. Cauda (*Atti Soc. Agron. Ital., 4–5 (1924), No. 3, pp. 115–125*).—Studies and observations are briefly reported, from which the conclusion is drawn that the rapid humification of cellulose in soils is a reduction process caused by the growth of certain organisms, of which the genus Coprinus is apparently the specific agent in the humification of straw. Humification is apparently accelerated by increasing the temperature.

Acid phosphate was found to impede humification, while basic substances such as compounds of sodium, potassium, and calcium, and especially sodium nitrate, favored it.

Nitrates and nitrites in cultivated soil [trans. title], A. Cauda (*Atti Soc. Agron. Ital., 4–5 (1924), No. 3, pp. 107–114*).—Studies on the relation between nitrates, nitrites, and ammonia in cultivated soils are briefly reported.

These indicate that the lower temperatures permit the prevalence of nitrites and ammonia and a deficiency in nitrates. All three were found in greater quantities in the surface than in the subsoils. Accumulations of nitrites were found in the deeper layers of soil following snow or rain. There was a deficiency of intrates and nitrites in acid or dry soils. Swampy soils rich in organic matter were found to be poor in nitrite compounds during cold weather, especially if saturated with water.

Nitrification in acid solutions [trans. title], T. Gaarder and O. Hagem (*Bergens Mus. Aarbok, Naturv. Raekke, 1922–23, No. 1, Art. 1, pp. 1–26, figs. 2*).—Studies are reported which showed that there are several nitrifying bacteria which require a quite variable reaction of the medium for their best activity. The optimum H-ion concentration for nitrification was found to be from pH 6.8 to 7.3. Nitrification was found to take place at pH values as low as from 4.8 to 5.5 and 6.1.

It is considered incorrect, therefore, to assume that the nitrifying power of a soil may be adequately determined by inoculation in ordinary Winogradsky's solution. It is necessary, on the other hand, to use a series of solutions with pH values varying between 4 and 8 in order to bring out the activities of all the nitrifying organisms.

It is also thought that the nitrification factor should be taken into consideration in liming soils, since a change in reaction produced thereby may hinder the activities of the prevailing types of nitrifying organisms.

Nitrate-forming bacteria [trans. title], J. Sack (*Centbl. Bakt.* [*etc.*], 2. *Abt., 62 (1924), No. 1–6, pp. 15–24, pl. 1*).—Studies are reported which showed that in addition to the nitrobacter of Wingradsky at least four other nitrate-forming bacteria exist which are able to attack cellulose and to live in nutritive media containing considerable organic matter and form nitrates from nitrites. These organisms can endure drying and then perform their functions in the presence of ammonium sulfate. They can also derive their carbon supply from carbon dioxide and from different organic materials, but not from carbonates.

Studies on the anaerobic decomposition of organic materials by bacteria from sewage sludge [trans. title], Bach and Sierp (*Centbl. Bakt.* [*etc.*], 2. *Abt., 62 (1924), No. 1–6, pp. 24–30, figs. 4*).—Detailed studies of the decomposition of various organic substances under anaerobic conditions by the bacteria present in sewage sludge are reported. All the materials tested, including raw meat, boiled white of egg, meat residues, fresh beets, raw potatoes, and fecal material, were decomposed more or less rapidly with the formation of methane, carbon dioxide, and hydrogen.

Comparative value of alfalfa and sweet clover on soils in the lower Yakima Valley, H. F. Holtz and H. P. Singleton (*Jour. Amer. Soc. Agron., 17 (1925), No. 6, pp. 326–333*).—Studies conducted at the Washington Experiment Station on the carbon dioxide evolution and nitrate accumulation in irrigated soils growing alfalfa and sweet clover, and to which legume hays were added as a fertilizer, are reported.

Soils from sweet clover land had 102 per cent greater carbon dioxide evolution and 95 per cent greater nitrate accumulation than soil from alfalfa land during the 44 days of the experiment. The comparative yields of corn were 14.92 tons of silage per acre on sweet clover land and 8.25 tons on alfalfa land. The two soils, after having produced a corn crop, proved to be very similar in carbon dioxide evolution and nitrate accumulation.

Both the virgin arid soil and the same soil after it had been irrigated and cropped to nonlegumes for two years showed a low carbon dioxide evolution

and nitrate accumulation, evidently because of their low organic matter content. When a legume hay was added to either a virgin soil or a soil cropped to nonlegumes, the amounts of carbon dioxide evolution and nitrate accumulation were practically equal to those for the same soils which had grown a legume in the field.

There was a greater carbon dioxide evolution during the first 10 days and a greater final nitrate accumulation from sweet clover than from alfalfa, whether they were grown in the field or applied as a residue.

Molecular condition, soil reaction, and fertilizer requirements [trans. title], R. GANSSEN (*Internatl. Mitt. Bodenk., 14 (1924), No. 3–6, pp. 158–171*).—Studies are reported which showed that the reaction of humid aluminum silicate soils can be determined on the basis of the degree of saturation of the silica-alumina gels.

The content of absorbed bases and the nitrogen absorption of cultivated aluminum-silicate soils were found to increase and decrease with the content of alumina soluble in hydrochloric acid, and not with the humus content. This is taken to indicate that the silica and alumina gels are mainly responsible for the fixation of bases in soil.

Weathering solutions, which result in the presence of unsaturated raw humus gels in forest soils, decrease the degree of absorption of silica-alumina gels and produce an acid molecular condition as a result. An acid molecular condition always accompanied the production of a high titration acidity, resulting from the treatment of aluminum silicate subsoils of northwest German forests with potassium chloride solution.

It is concluded that determinations of the H-ion concentration of soils saturated with bases should be made with naturally moist soils, and this is considered to be more important for alkaline soils than for acid soils.

Soil productivity [studies at the Tennessee Station, 1924] (*Tennessee Sta. Rpt. 1924, pp. 34–40, figs. 6*).—A brief summary is presented of the results of soil nitrogen, liming, and manuring experiments at the station.

It is reported that leguminous crops are the most important practical means of increasing the supply of soil nitrogen in the State, but that such legumes as cowpeas and soy beans are of little value as compared with red clover, crimson clover, alfalfa, and sweet clover. The best legumes for soils deficient in lime are said to be lespedeza, crimson clover, and hairy vetch.

Heavy applications of burnt lime may cause excessive losses of both nitrogen and sulfur and also make some soils too loose. Liming does not liberate soil potash.

The results of 19 years' experiments on the use of barnyard manure are said to have indicated crop increases due to manuring of $2 per ton on bottomland and $2.50 per ton on upland.

Hygroscopicity and cakiness of fertilizer materials, A. B. BEAUMONT and R. A. MOONEY (*Indus. and Engin. Chem., 17 (1925), No. 6, pp. 635, 636*).—In a contribution from the Massachusetts Agricultural College the results of a study of the hygroscopicity and cakiness of 18 fertilizer materials and 3 mixtures under the conditions of temperature and humidity prevailing in Massachusetts during the summer season are reported.

The results showed that there are significant differences between the hygroscopic values for the same substance at different humidities, and that there is a changing relationship among the materials as to their hygroscopicity, depending upon conditions of humidity. The differences tend to lessen with increasing humidity. Calcium nitrate was the only material to absorb sufficient moisture at 78 per cent humidity to show free water. At 87.75 per cent

humidity ammonium nitrate, ammonium sulfate nitrate, calcium nitrate, sodium nitrate, and potassium chloride showed free water, and at 97.5 per cent urea and kainit showed free water. None of the remaining inorganic materials or any of the organic materials or mixtures showed free water under the conditions of the experiments, although the moisture content was very high in some cases and the substances appeared moist. Urea, although chemically organic, behaved like an inorganic substance.

Water intake seemed to be due to absorption and adsorption. Adsorption was slight for the inorganic materials, whereas absorption became dominant at higher humidities. With the organic materials adsorption was always dominant. It was found that the appearance of the material may not be a reliable criterion for judging its moisture content.

The data indicate that the moisture intake, through its effect on weight, may be great enough in some instances to warrant its consideration in the buying and selling of materials.

Use of new nitrogenous fertilizers [trans. title], Brétignière, Verchère, and Cartier (*Compt. Rend. Acad. Agr. France, 11 (1925), No. 3, pp. 91–95*).—Comparative tests of ammonium chlorohydrate and urea with sodium nitrate and ammonium sulfate on root and cereal crops are briefly reported.

The best results in general were given by sodium nitrate, while ammonium sulfate and ammonium chlorohydrate were about equal in value for cereals. The chlorohydrate was superior for root crops. Urea gave results almost as good as those given by sodium nitrate, but was more difficult to use in proper amounts.

Physiological characteristics of ammonium nitrate [trans. title], D. N. Prjanischnikow [Prianishnikov] (*Ztschr. Pflanzenernähr. u. Düngung, 4 (1925), No. 4, Wiss., pp. 242–250*).—Studies on the assimilation by plants of ammonia and nitrate from ammonium nitrate showed that the ammonia was more extensively and rapidly assimilated than the nitrate, and that ammonium nitrate is therefore essentially a physiologically acid fertilizer.

Some properties of urea with reference to soil [trans. title], F. Couturier and S. Perraud (*Compt. Rend. Acad. Agr. France, 11 (1925), No. 16, pp. 492–496*).—Studies are reported showing that soils do not absorb urea but that its biological transformation into ammonium carbonate in soils is quite rapid, the rate being practically proportional to time of contact and markedly affected by temperature. These results are considered to have an important bearing on the use of urea as a fertilizer, owing to the possibility of nitrogen losses as ammonia when used unseasonably.

Test on the solubilization of tricalcium phosphate in soil under the influence of an acid salt [trans. title], M. Fouassier and J. Lhomme (*Compt. Rend. Acad. Agr. France, 11 (1925), No. 3, pp. 95–98*).—Tests of the influence of sodium bisulfate on the solubility of the phosphoric acid in tricalcium phosphate are briefly reported, indicating that, within the limits of the experiments, the solubility increased in proportion to the quantity of bisulfate used.

Investigations on the cause of the yield-increasing action of silica [trans. title], O. Lemmermann, H. Wiessmann, and K. Sammet (*Ztschr. Pflanzenernähr. u. Düngung, 4 (1925), No. 5, Wiss., pp. 265–315*).—Studies are reported which showed that silica is able to produce important increases in crop yields only when there is a deficiency of available phosphoric acid in the soil. No direct growth-promoting properties of silica could be demonstrated. The cause of the favorable action is apparently due to the bringing about of an increased assimilation of phosphoric acid by plants, so that smaller total quantities of phosphoric acid in the fertilization suffice to produce the same

crop with silica as is produced by larger quantities of phosphoric acid without silica. The increased utilization of phosphoric acid by plants fertilized with silica is attributed to the dissolving action of the silica on phosphate compounds and not to a modification of plant functions.

Explanation of the yield-increasing action of colloidal silica in sand cultures deficient in phosphoric acid [trans. title], F. DUCHOŇ (*Ztschr. Pflanzenernähr. u. Düngung, 4 (1925), No. 5, Wiss., pp. 316–325*).—Studies are reported which showed that the favorable action of colloidal silica on crop yields in sand cultures with insufficient phosphoric acid fertilization is due mainly to the physical properties of the colloid, which tend to improve the unfavorable physical condition of the sand and permit the better utilization of what little phosphoric acid is available. The same effect can be produced in sand soil by the use of stable or green manures. This is taken to indicate that the use of colloidal silica for this purpose has no particular significance in actual practice.

Has silicic acid an influence on the morphological and anatomical structure of rye straw in the presence of a phosphoric acid deficiency? [trans. title], H. WIESSMANN (*Ztschr. Pflanzenernähr. u. Düngung, 4 (1925), No. 1–2, Wiss., pp. 73–83*).—Studies are reported which showed that, while fertilization with silica enriched rye straw in silica almost sevenfold, no influence was apparently exerted on its inner structure.

Experiment with "Asahi-Promoloid" [trans. title], O. LEMMERMANN and H. WIESSMANN (*Ztschr. Pflanzenernähr. u. Düngung, 4 (1925), No. 6, Wiss., pp. 345–347*).—Sand culture studies with so-called "Asahi-Promoloid," a colloidal magnesium silicate, showed a small increase in the yield of Italian rye grass in the presence of a phosphoric acid deficiency.

Action of natural limes and marls and of some calcium and magnesium compounds on cultivated soil [trans. title], A. GEHRING and C. SCHÜLCKE (*Ztschr. Pflanzenernähr. u. Düngung, 4 (1925), No. 3, Wirtschaft.-Prakt., pp. 113–139*).—Studies of the influence of fineness of pulverization on the solubility of lime in soils and of the action of different materials containing lime on the physical, chemical, and biological phenomena in soils are reported.

These indicated that the influence of liming on the physical properties of the soil is of greater importance than that on the chemical properties. The physical properties of soil were found to undergo profound changes under the influence of liming, which in turn largely control the intensity of the biological changes.

Carbon dioxide fertilizer [trans. title], GERLACH and SEIDEL (*Ztschr. Pflanzenernähr. u. Düngung, 4 (1925), No. 6, Wirtschaft.-Prakt., pp. 241–247*).—Tests of a so-called carbon dioxide fertilizer containing 30 per cent of peat, 15 per cent of carbonaceous material, and 5 per cent of so-called catalytic material are briefly reported. No increases in crop yields were obtained with this material which could be attributed to its content of organic matter, and in some cases the yield of lupines was decreased.

AGRICULTURAL BOTANY

The nature of life, W. J. V. OSTERHOUT (*New York: H. Holt & Co., 1922, pp. VII+117*).—This book deals with fundamental questions and related considerations as bearing upon the origin of life, growth, reproduction, motion, irritability, metabolism, selective permeability, electrical forces, and the control of life. Authorities and their findings are mentioned, but no bibliography is given.

Fundamentals of chemical researches on plants, L. Rosenthaler (*Grundzüge der Chemischen Pflanzenuntersuchung. Berlin: Julius Springer, 1923, 2. rev. and enl. ed., pp. [4]+115*).—The first part of this book deals with method in a somewhat general way, and the second with methods suited to actual or possible chemical constituents of plants taken more or less individually. The literature comprises 105 titles.

Carbon nutrition in cultivated plants [trans. title], [F.] Bornemann (*Angew. Bot., 7 (1925), No. 3, pp. 184–188*).—Citing briefly related work by others, the author states that he was able to show experimentally that with like nutritive media supplied to the roots, blooming was heightened by increase and lowered by decrease of carbon dioxide.

A note on growth and the transport of organic substances in bitter cassava (Manihot utilissima), T. G. Mason (*Roy. Dublin Soc. Sci. Proc., n. ser., 17 (1922), No. 11–13, pp. 105–112, fig. 1; also in Notes Bot. School Trinity Col., Dublin, 3 (1923), No. 4, pp. 216–223, fig. 1*).—In work seeking for evidence of a factor correlating cell activity in the apical meristem with the growth of tuberous roots of bitter cassava (*M. utilissima*), measurements of stem height were made weekly for 18 weeks, and at the end of the twenty-seventh week, half of the plants being ringed 15 weeks before the termination of the experiment.

The ringed plants first commenced to lag behind the unringed at the end of 3 weeks. They finally produced about one-fourth the weight of the tubers, but a greater weight of stems, as compared with the unringed plants.

It is concluded that the activity of the cells of the apical meristem was not controlled by the supply of organic substances available, but was, on the contrary, determined by autogenous changes within the growing point. No evidence was obtained of the presence of a factor correlating the activity of the apical meristem and the growth of the tuberous roots. The experimental results, it is pointed out, accord with the view that the rate of growth of the stem was conditioned by the catalytic activity of the cells of the apical meristem.

The influence of water in optimum quantity during different growth periods of the plant [trans. title], M. Chiriţescu-Arva (*Bul. Inform. Jard. et Mus. Bot. Univ. Cluj, Roumanie, 3 (1923), No. 3, pp. 78–80*).—Wheat was studied through three periods from seeding to maturity as regards developmental data, which are detailed for different parts of the plant for these three periods.

Water exchange by mosses with the atmosphere [trans. title], A. Mayer and L. Plantefol (*Compt. Rend. Acad. Sci. [Paris], 179 (1924), No. 3, pp. 204–206*).—Investigation of the phenomena of hydration and of desiccation in mosses enables the study, under conditions particularly favorable, of the connection between a living cell and water. An examination of the vapor tensions resulted in the delimitation of three zones. One of these is that of residual water, in which the connection is particularly strong. In a second zone the tension of water vapor approaches that of water itself, and exchanges may be determined by the osmotic pressure of solutes. In a third (an intermediate) zone, here considered as very important, the exchanges appear to be reversible, the curve of equilibrium being continuous and the intensity doubling for a temperature elevation of 10° C. The character of the force, or forces, involved and the significance of the facts observed are briefly discussed.

Studies on the hydrogen ion concentration of plant juices.—I, Preliminary studies on the changes in the hydrogen ion concentration of plants during their development, F. G. Gustafson (*Mich. Acad. Sci., Arts, and Letters, Papers, 2 (1923), pp. 49–52, fig. 1*).—Studies on three bean varieties show a decrease of H-ion concentration with advancing maturity.

The alkaline reaction of the dew on cotton plants, C. M. SMITH (*Science, 61 (1925), No. 1587, pp. 572, 573*).—In continuation of investigations previously reported (E. S. R., 50, p. 525), the author reviews the criticisms of Mills (E. S. R., 52, p. 427) and of Power and Chesnut (E. S. R., 52, p. 519) regarding the alkalinity of dew on cotton plants. Under a discussion of the question of the reaction of alkaline earth carbonates to phenolphthalein, attention is called to the presence in the dew of potassium equivalent to 252 parts of K_2O per million, a condition that would indicate the possibility of the presence of potassinm carbonate in the dew.

On the cause of the alkalinity of the dew, the anthor claims that the question as to whether it is due chiefly to carbonates or to ammonia and trimethylamine remains to be determined.

The distribution of iron in plants [trans. title], L. and D. LEBOUX (*Rev. Gén. Bot., 35 (1923), Nos. 409, pp. 24–33; 410, pp. 57–70*).—In studies which are here claimed to have been completed before the appearance of the data furnished by Maquenne and Cerighelli (E. S. R., 50, p. 128), the authors fonnd that iron always constitutes small but very variable proportions of the dry matter of different parts of plants. It is, however, greater in the case of conifers.

Alkaline chlorosis of grapevines [trans. title], U. PRATOLONGO (*Atti R. Accad. Naz. Lincei, 6. ser., Rend. Cl. Sci. Fis., Mat. e Nat., 1 (1925), No. 6, pp. 319–322*).—Referring to the findings published by Sidorin (E. S. R., 36, p. 633), the author claims that experimentation has shown that the occurrence of chlorosis may be due to such a suspension or localization of absorption of iron and phosphorus in the plant. A brief discussion is given of previons related contributions (E. S. R., 48, p. 811; 51, p. 116).

[Anomalies in orchard growths] [trans. title], E. WERTH (*Angew. Bot., 7 (1925), No. 3, pp. 121–152, figs. 12*).—Various imperfections or anomalies noted in connection with fruit growing are outiined or instanced, with discussion.

Injuries to vegetation by smoke gases and factory exhalations, J. STOKLASA (*Die Beschädigungen der Vegetation durch Rauchgase und Fabriksexhalationen. Berlin: Urban & Schwarzenberg, 1923, pp. XXIV+487, pls. 21, figs. [39]*).—Dealing in this work prominently with toxic smoke constituents and acid fumes, the author emphasizes the injurious influences of sulfur dioxide and sulfuric acid on the metabolic processes as a whole in plant, animal, and human organisms and the resulting losses. An extensive list of references to the literatnre is given.

Formation of plastids in plants [trans. title], L. EMBERGER (*Compt. Rend. Acad. Sci. [Paris], 179 (1924), No. 7, pp. 420–422, figs. 4*).—The results are given, with discussion, of an examination of cell changes in *Ficaria* sp. *Scolopendrium* sp., *Lilium candidum*, and *Pellionia daveauana* during developmental alterations involving plastids.

Continuous reproduction of microorganisms in synthetic media, C. H. WERKMAN (*Science, 62 (1925), No. 1596, pp. 115, 116*).—As a result of his experiments, the author believes it is reasonable to conclude that certain yeasts, torulae, and bacteria may be continuously cultured in a medium wholly synthetic, and that no addition of vitamin B or substances of the nature of bios is necessary. If such substances were necessary for the growth and reproduction of these organisms, they must have been metabolized.

On cytomorphosis in bacteria, A. T. HENRICI (*Science, 61 (1925), No. 1591, pp. 644–647, fig. 1*).—From a study of species of Bacillus and Bacterium the author concludes that the cells of bacteria undergo a regular metamorphosis

during the growth of a culture similar to the metamorphosis exhibited by the cells of a multicellular organism during its development. Each species is said to present three types of cells, a young form, an adult form, and a senescent form. These variations are held to be dependent on the metabolic rate, the change from one type to another occurring at points of inflection in the growth curve. It is claimed that the young or embryonic type is maintained during the period of accelerating growth, the adult form appears with the phase of negative acceleration, and the senescent cells develop at the beginning of the death phase.

Observations on the causes of gregarious flowering in plants, W. Seifriz (*Amer. Jour. Bot., 10 (1923), No. 2, pp. 93–112, pl. 1*).—Citing the work and views of several authors, notably those of Garner and Allard (E. S. R., 42, p. 818), of Klebs (E. S. R., 28, p. 39), and of Howard (E. S. R., 23 p. 526), the present author submits evidence bearing on the question of an inner or an environmental origin of cyclic tendencies observable in certain plants. It is considered as at present impossible to say, for example, how an apparently innate sexual periodicity of certain palms came into existence.

"The belief in a germinal factor as the cause of gregarious flowering in bamboos does not imply that this heritable determiner is past being influenced by the external environment, . . .

"It is impossible to deny the assumption of Klebs that where we are unable to find the controlling environmental factors we have simply failed to search far enough; yet, until the exact combination of external stimuli is found, the theory that gregarious flowering is determined by a germinal factor stands without disproof."

Gregarious flowering, T. Petch (*Ann. Roy. Bot. Gard. Peradeniya* [*Ceylon Jour. Sci., Sect. A*], *9 (1924), No. 1, pp. 101–117*).—As bearing upon the questions dealt with by Seifriz in the article noted above, the author contributes a discussion of that statement, of other information based partly on his own observations or experiences, and of the difficulties and possibilities of a proposed series of observations more extensive and exhaustive than any yet recorded.

Variation and correlation in the inflorescence of Manfreda virginica, J. A. Harris (*Ann. Missouri Bot. Gard., 11 (1924), No. 4, pp. 411–459, figs. 13*).—This paper, one of a series on the physiology of fertility in plants, presents results of study carried on mainly during 1906–1908 on variation and correlation in the inflorescences of *M. virginica.*

The result considered as of greatest importance is the generally low correlation between the meristic characters of the inflorescence of *M. virginica* and seed production. Variation in seed production is clearly the resultant of underlying causes, but these causes are not easily located in the variations of the magnitudes of the antecedently formed structures. There is little relationship between the number of flowers formed per inflorescense and the number of seeds matured per locule.

Practical plant ecology, A. G. Tansley (*London: George Allen & Unwin; New York: Dodd, Mead & Co., 1923, pp. 228, figs. 15*).—This book is intended as a guide. Parts 1 and 2 aim at providing the minimum theoretical basis which will serve as a satisfactory framework for field studies of plant communities. Part 3 deals with the study of vegetation itself, part 4 with habitat analysis in a somewhat elementary manner, and part 5 with school work in ecology. An appendix contains additional information on various topics, and a list is furnished of papers on British vegetation, arranged somewhat geographically.

Researches on the vegetation of Natal.—Series I, J. W. BEWS and R. D. AITKEN (*So. Africa [Dept. Agr.] Bot. Survey Mem. 5 (1923), pp. 70, pls. 3, figs. 4*).—This series, besides hitherto unpublished research by Aitken on the distribution and ecology of the genus Cussonia, includes work by G. W. Gale on the measurement of the size of the aeration system of the leaves of certain Natal plants by an injection method; by F. N. Howes on a new calcium chloride method of measuring the resistance of leaves to water loss; by L. P. McGuire on the measurement of light intensity in South Africa with special reference to plant habitats; and by P. Hardaker on the rate of water loss during the drying of leaves.

The lupine, F. BOAS and F. MERKENSCHLAGER (*Die Lupine als Objekt der Pflanzenforschung. Berlin: Paul Parey, 1923, pp. VIII+144, figs. 63*).—A monographic presentation is made of studies carried out on the morphology, anatomy, physiology, and pathology of the genus Lupinus, about five species of which are included in this account.

GENETICS

Genetic studies in potatoes: McKelvie's Arran Victory mutations, R. N. SALAMAN (*Jour. Genetics, 15 (1925), No. 3, pp. 267–300, pls. 2, figs. 6*).—According to detailed study and genetic analysis, McKelvie's mutations (E. S. R., 47, p. 36) of Arran Victory are characterized by increasingly greater losses of pigment in the tuber, while up to a certain stage the other parts of the mutant plants do not vary from the type. When the loss of pigment from the tuber is practically complete, a change occurs in the haulm and in the shape of the tuber. The loss of pigment does not prevent confirmation of the relationship of this extreme mutant form with the type plant.

After the type and all the mutants were crossed by the same domestic seedling, an analysis of the resultant families demonstrated that with the reduction of pigment in the tuber there is in like proportion a reduction in the number of ovules which can give rise to colored tubers. Parallel with this decrease is a reduction of color in the stems, following closely the decrease of pigment in the mutant mother tuber. There is an excess of long-tubered seedlings in the family derived from the mutant losing the most pigment. Some evidence was noted that the heritable cropping capacity of the mutants is lowered with the loss of pigment in the tuber. Both the type and all the mutant forms convey to their seedlings the same degree of susceptibility toward leaf roll and mosaic as well as toward the attacks of *Phytophthora infestans*. The somatic mutations of the tuber are, in this case, similarly represented by appropriate changes in the germ cells present in the ovaries of the plants from such tubers. "A somatic mutation which is characterized by the loss of a specific character such as pigmentation of the tuber skin may evince this loss in other directions both in its own body and, through its germ cells, in its offspring."

Genetic and cytological studies in wheat, I, II, A. E. WATKINS (*Jour. Genetics, 14 (1924), No. 2, pp. 129–171, figs. 77; 15 (1925), No. 3, pp. 323–366, figs. 28*).—To elucidate the manner of segregation shown by F_2 of Rivet (*Triticum turgidum*) × Swedish Iron (*T. vulgare*), cytological studies were made on plants from the F_2 of this cross and from the F_2 of Rivet × a smooth chaffed awnless variety of *T. vulgare* from Mesopotamia.

The F_1 from *T. turgidum* (haploid chromosome number=14) × *T. vulgare* (21) contains 35 chromosomes; at reduction 14 of those from one parent pair with 14 from the other, leaving 7 chromosomes unpaired. In the F_2 and later generations, unpaired univalent chromosomes appear, and their behavior during the reduction divisions is described in detail. The bivalents behave normally

throughout these divisions, whereas the behavior of the univalents is quite different.

The frequencies of microspores possessing the various possible chromosome combinations were calculated, the result probably indicating the frequencies of the classes of male gamete. In F_2 and later generations plants with less than 35 chromosomes all have 14 bivalents—never more, while in plants with more than 35 chromosomes the sum of the number of bivalents and of univalents always equals 21. Theories are suggested to account for these facts.

Part 2 reports studies of the reduction in the megaspore mother cell, the development of the embryo sac, fertilization, germination of the grain, and related problems in wheat. The reduction in the megaspore mother cell was described from F_3 plants of Rivet × Yeoman, from F_1 plants from Rivet × Swedish Iron, and from some of the material used above to describe reduction in the microspore mother cells. The development of the embryo sac and fertilization are described from F_3 plants from Rivet × Yeoman. All the plants used were known to have univalent chromosomes and were partially sterile.

The reduction divisions follow the same course in both megaspore and microspore mother cells, and chromosomes are lost about as often in both cases. A univalent chromosome is probably less liable to be included within the nucleus of the innermost megaspore than within a microspore nucleus. A small proportion of ovules from F_2 and F_3 plants are found empty at the time the spike begins to bloom, but, with these exceptions, the development of the embryo sac from the megaspore is normal, only functional egg cells being obtained. Many of the latter fail to become fertilized through lack of sufficient functional pollen, and in consequence natural crossing may sometimes occur. Embryo and endosperm development are normal. Many grains from partially sterile plants do not germinate, or else give plants that do not survive. This occurs too seldom to account for the absence of certain chromosome combinations, so long as it is assumed that the various classes of functional male gametes are as frequent as the microspore classes. A method of studying the germination of pollen grains on the stigma has been given. Most of the morphologically perfect pollen grains from F_1 plants do not germinate on the stigmas of the F_1 or on those of either parent.

The failure of miscrospores to give pollen grains that germinate appears to be selective with respect to the number of chromosomes they contain, failure being least likely with those possessing either 14 or 21 chromosomes.

The genetics of the sheep, J. A. F. Roberts and F. A. E. Crew (In *Bibliographia Genetica. The Hague: Martinus Nijhoff, 1925, vol. 2, pp. 263–286*).—The authors have discussed the inheritance of various characters in sheep under the following divisions: Pigmentation, fleece characters, horn growth, ear length and form, profile, tail length and form, number of mammae, mutton points, fecundity and fertility, the Ancon sheep, and sheep×goat hybrids. An extensive bibliography of the inheritance of characters in sheep is included.

The genetics of Drosophila, T. H. Morgan, C. B. Bridges, and A. H. Sturtevant (In *Bibliographia Genetica. The Hague: Martinus Nijhoff, 1925, vol. 2, pp. 1–262, figs. 68*).—A presentation of the modern knowledge of the genetics of *D. melanogaster* and other species taken up under the headings of biology, chromosomes, mutation, multiple allelomorphs, modifying factors and selection, viability and lethals, abnormalities that are not inherited, inferences concerning the nature of the genes, linkage, nondisjunction of the X chromosomes, the attachment of X chromosomes to each other, nondisjunction of the fourth chromosome, gynandromorphs and mosaics, triploidy, intersexes,

supersexes, deficiency, duplication and translocation, cytological and genetic comparison of the species of Drosophila, genetics of *D. simulans*, genetics of other species of Drosophila, parallel and corresponding genes, and list and descriptions of the mutant characters of *D. melanogaster*. An extensive bibliography is also included.

Fertility and toleration of temperature in inbred Drosophila, M. B. STRAUSS (*Amer. Nat., 59 (1925), No. 663, pp. 379–384*).—Three lines of inbred Drosophila isolated from a mass collection from Sweden have been tested as to their comparative fertility and toleration to temperature.

One line, C, in the fifth generation developed an eye mutation called Brown-II. The fifteenth generation was hatched at Woods Hole, Mass., in August, where considerable fluctuation between the day and night temperatures occur. Line C produced another generation before a fertile pair occurred in line A, and a further generation of both these lines occurred before line B yielded a fertile pair. The unfavorable temperature was thought to have brought out genetic differences in the lines. Later, under a control temperature of 24° C. (75.2° F.), there were produced in eight generations an average of 213.1 flies per mating in line C, 88.5 in line A, and 17.6 in line B. The average numbers of eggs laid in 10 days on banana agar spread on a microscopic slide were 623 for line C, 131 for line A, and 105 for line B. The percentages developing into imagos were, respectively, 38.8, 70.9, and 25.7. The relatively poor development of line C was attributed to crowding.

Crosses between the strains showed that the average number of F_1 progeny per mating was similar to the number produced by the line from which the female came, but in the second generation there was an increase over the numbers produced in any line. In four tests of the effect of higher temperatures, it was found that the mass Swedish stock, the crossbred stock, and the three inbred lines, except one bottle from C, which was carried five generations, were unable to produce second generation offspring when subjected to a temperature of from 30 to 32.5°. A fifth test showed that lines A and B could not produce second generation offspring at 29.5°, while second generation offspring were produced by line C, the three crossbred lines, and the Swedish stock. Two crossbred lines and the Swedish stock produced a third generation. The numbers of young produced by the different lines at 29.5°, though not as large, showed the same relation to each other as in control tests.

The effects of unequal crossing over at the bar locus in Drosophila. A. H. STURTEVANT (*Genetics, 10 (1925), No. 2, pp. 117–147, figs. 10*).—In studies at Columbia University, 16 different changes at the bar locus in Drosophila have been found to occur almost entirely in eggs that undergo crossing-over at or near this point. It is supposed that these types have occurred from unequal crossing-over resulting in one daughter chromosome getting two representatives of the bar gene, while the other received none. A less extreme type of bar, called infrabar, resulted from the only mutation known to have occurred in the male at this locus. Individuals containing infrabar and bar in the same chromosome have been produced by unequal crossing-over. An analysis of the facet counts of all combinations of the bar series, i. e., round, infrabar, bar, double-infrabar, bar-infrabar, and double-bar, showed that when the two genes lie in the same chromosome they are more effective than when lying in different chromosomes. A discussion of the possibility of other mutations being explained on the basis of unequal crossing-over led to probable negative conclusions.

Polyploidy in Drosophila melanogaster with two attached X chromosomes, L. V. Morgan (*Genetics, 10 (1925), No. 2, pp. 148–178, figs. 6*).—Further studies of the behavior of the chromosomes and characters associated with them in Drosophila having two attached X chromosomes (E. S. R., 48, p. 165) are reported from Columbia University. These results have largely borne out the conclusions of the preceding work.

It has been found that the chromosomes are attached at their right ends. In a few cases there have occurred patroclinous females resulting from a Y-bearing egg fertilized by a nondisjunctional XX bearing sperm. A few intersexes have been found among the offspring of females with attached X chromosomes, which include triploid females with two attached X chromosomes and a free X chromosome, one triploid female with two attached X chromosomes and two free X chromosomes, and three composite flies having superfemale and female regions or a triploid and an intersex region. Crossing-over has been found to occur between attached and free X chromosomes and between attached X chromosomes.

Why polyploidy is rarer in animals than in plants, H. J. Muller (*Amer. Nat., 59 (1925), No. 663, pp. 346–353*).—The more frequent evidence of polyploidy in plants than in animals is discussed and attributed largely to the interrelation of the chromosomes with sex in animals, while plants are mostly hermaphroditic. Tetraploid individuals usually result from matings of triploid parents, but in bisexual organisms the heterozygous sex can not exist in the triploid condition. It is pointed out, however, that tetraploid animals may be produced by the union of a diploid gamete of the homozygous sex, produced from a triploid animal or through mitotic irregularities by a diploid animal, with a diploid gamete produced irregularly by the heterozygous sex; or through irregularities in the early cleavage of a diploid fertilized egg. If the tetraploid animals were produced, they would tend to be eliminated largely by the handicap of their sex-differentiating mechanism. The possibility of testing out these hypotheses is suggested.

The chromosomes of four species of marsupials, S. C. A. Altmann and M. E. W. Ellery (*Quart. Jour. Micros. Sci. [London], n. ser., 69 (1925), No. 275, pp. 463–469, pls. 2*).—The chromosome numbers are reported for four species of marsupials, as determined at the University of Melbourne, by Altmann for *Trichosurus vulpecula, Pseudochirus peregrinus,* and *Phascolomys mitchelli,* and by Ellery for *Potorous tridactylus.* The diploid numbers of chromosomes, including the sex chromosomes, were 20 for *T. vulpecula,* 20 for *P. peregrinus,* 14 for *P. mitchelli,* and 12 for *P. tridactylus.* The Y chromosome was demonstrated in the males of all species.

The occurrence of an eye and of a tooth abnormality in a line of albino rats, E. Jones (*Abs. in Anat. Rec., 29 (1924), No. 2, p. 142*).—In attempts to modify experimentally the germ plasm in albino rats at the University of Maine, two abnormal-eyed individuals were produced in one litter. This abnormality has been found to be transmitted in succeeding generations in an irregular manner. An abnormality of the teeth later appeared in this line, consisting of a lack of growth control of the incisors of either or both jaws. The teeth formed long tusks which curled back into the mouth or outside over the lips. These abnormalities are not claimed to be a direct result of the treatment, but over 500 controls failed to show either abnormality.

Eye defects in the white rat, J. A. Detlefsen (*Abs. in Anat. Rec., 29 (1924), No. 2, p. 142*).—A single female rat appearing in normal stock at the Wistar Institute was found to have a retinal hemorrhage, and when mated to her normal brother produced two abnormal offspring. In additional mat-

ings a total of 19 abnormals had occurred in 80 offspring. Either or both eyes may be affected with the condition, which includes opacity of the lens, microphthalmia, complete resorption of the eye, retinal hemorrhage, colomboma, and adhesions of the iris to the lens.

Another type of abnormality which is apparently not inherited has appeared in unrelated stocks. Microphthalmia and in some cases opaque lenses have appeared in three separate individuals which, when mated together or mated to normals, produce only normals, and the F_2s have likewise been normal.

A type of semisterility in rice [trans. title], KONDÔ, MANTARÔ, and M. ONO (*Nôgaku Kwaihô* (*Jour. Sci. Agr. Soc.* [*Japan*]), *No. 250 (1923), pp. 589–598, pls. 2; abs. in Bot. Abs., 14 (1925), No. 8, p. 1086*).—In 1916 a semisterile rice plant, characterized by thick stalks, large grains, and loose awned panicles, suddenly appeared in a pure line of Sinriki at Ohara Institute. Subsequent studies of these plants in pedigree cultures showed that without exception the entire offspring was semisterile. These semisterile plants are homozygous, quite different from other semisterile rice types which produce both semisterile and fertile offspring. The percentage of sterility in the new type has in different years ranged from 61 to 81 per cent, averaging 67 per cent as compared with less than 50 per cent in other types of semisterile rice.

No particular zone of unfertilized flowers appeared to exist. Probably more unfertilized flowers are present in the secondary shoots than in the primary shoots. Differences in sterility according to stalk length could not be established.

New data showing aberrant ratios in the E allelomorphic series in guinea pigs, H. L. IBSEN (*Abs. in Anat. Rec., 29 (1924), No. 2, pp. 140, 141*).—In further tests of a deficiency in the occurrence of e^pe^p offspring in matings involving complete extension, partial extension, and nonextension of black or chocolate individuals, e^pe^p females mated with Ee^p males produced 81 Ee^p and 41 e^pc^p offspring, and ee females mated with Ee^p males produced 56 Ee and 76 e^pe offspring. Matings of Ee^p females with e^pe^p males produced 01 Ee^p and 51 e^pe^p offspring, but when snch females were mated with ee males they produced 65 Ee and 51 e^pe offspring. Ee males mated with e^pe^p females produced 32 Ee^p and 48 e^pe individuals, while Ee males mated with ee females produced 71 Ee and 80 ee offspring. The reciprocal cross produced 58 Ee and 38 ee offspring. No satisfactory explanation as to the peculiar ratios was offered.

The salmon-eyed gene in guinea pigs, H. L. IBSEN and P. W. GREGORY (*Abs. in Anat. Rec., 29 (1924), No. 2, p. 140*).—The behavior of a character described as salmon eye color is noted from experiments conducted at the Kansas Experiment Station. In general appearance such eyes are pink, but show a ring of dark pigment surrounding the pupil on closer examination. The factor for this character has no influence on coat color. It behaves as a recessive to the normal and is evident only in the presence of the dominant allelomorph for pink eye. Matings of homozygous pink eyed guinea pigs with homozygous salmon eyed guinea pigs resulted in 28 offspring all dark eyed. The F_2 offspring were 8 dark eyed, 1 salmon eyed, and 8 pink eyed, the expected ratio being 9 : 3 : 4.

Other matings furnish additional proof of this method of inheritance. Certain modifying factors are operative on the expression of salmon eye which reduces the pigment to such an extent that it resembles pink eye except for the modification in hair color. No linkage relations were indicated between pink eye and salmon eye.

Hereditary anemia in mice and its relation to dominant spotting, S. B. DE ABERLE (*Amer. Nat., 59 (1925), No. 663, pp. 327–335, fig. 1*).—The author describes the occurrence of 75 anemic young among the offspring of mice carrying the factor for dominant spotting. The anemic individuals had a pale skin, showed a marked deficiency in the erythrocyte number, and usually died between birth and 5 days, though they consumed relatively large amounts of milk. In 122 matings of parents heterozygous for dominant spotting (*Dd*), 15 per cent of the young were anemic and the average litter size was 4.098, while no anemic offspring occurred in 38 matings of heterozygotes (*Dd*) with recessives (*dd*) and the average litter size was 4.86. Due to the interference with the results from young being eaten and not found, the uteri of pregnant females were examined from the sixteenth to the twentieth day of gestation, and it was found that 24.64±1.96 per cent of the fetuses so observed were anemic when the matings were of *Dd*×*Dd* parents, while none were anemic from matings of *Dd*×*dd* parents. There were, however, a large percentage of dead implantations from each mating, 21.85 and 22.54 per cent, respectively. The anemic young were considered to be the homozygous dominant individuals resulting either as a direct action of the factor *D* or one closely linked with it.

Further experiments bore out this conclusion. It was suggested that the dead implantations were probably due to another lethal factor not so far associated with a somatic character. Overcrowding was apparently not responsible, since 60 per cent of 50 uteri containing litters of 7 or over contained dead implantations as compared with 51 per cent of 62 uteri containing litters of 6 or less.

Further data on the inheritance of the sex-linked barred pattern of domestic fowls, L. C. DUNN (*Abs. in Anat. Rec., 29 (1924), No. 2, p. 142*).—The author has found in experiments at the Connecticut Storrs Experiment Station that the typical Barred Rock feather pattern was due to at least three genes, i. e., *B* for barring, E^m for extension of melanin to all parts of the plumage, and *S* for silver or inhibitor of buff or yellow pigment. By recombining these genes in crosses a new type of sex-linked barring has been produced in which the black crossbars of the Rock type have been replaced by yellow. Under such conditions the yellow-white barred individuals are genotypically $e^me^mB(b)ss$. Further results have indicated that barring regulates the deposition of both black and yellow pigment, and that the white spaces in black-white barring are not due to the action of the silver gene. The results of crosses of males heterozygous for the three factors with black, barred, and buff females indicate that E^m prevents the development of yellow and white barring and makes the measurement of linkage between *B* and *S* difficult.

A comparison of the action of these genes with the genes involved in sex-linked barring and in Punnett's autosomal barring is given.

Bud selection in the Washington Navel orange, [I]–III, A. D. SHAMEL, C. S. POMEROY, and R. E. CARYL (*Jour. Heredity, 16 (1925), Nos. 7, pp. 233–241, figs. 6; 8, pp. 299–306, figs. 5; 10, pp. 367–374, figs. 4*).—Progeny trees propagated from sporting limbs, discovered by the senior author on a single tree of the Thomson strain of a Washington Navel orange, have during their first five years of fruiting borne fruits like those of the parent limbs. In three instances, namely, Thomson, Washington, and Golden Buckeye strains, all the fruits have resembled the parent type, and in one case, Corrugated strain, a major portion of the fruit conformed to the parent form. The sporting tendency of the Corrugated strain is deemed to be an indication of the instability characterizing the parent limb. Fruits of the various types are illustrated. In the second article the authors report that propagations from Wash-

ington Navel limbs bearing offtype, thick-rinded, worthless fruits have yielded during the five seasons 1920–21 to 1924–25 fruits similar to those borne by the parent limbs.

In the third article the authors discuss results attained in propagating the so-called Australian strain, characterized by strong vegetative growth and low production of late ripening, light colored, variably sized, poor flavored fruits. Records taken on the quantity and quality of fruit borne on young trees grown from buds taken from four Australian trees, from two Australian limb variations in trees of the Thomson strain, and from normal Washington and Thomson strains showed a strict conformity with the behavior of the parents, indicating that productive capacity and fruit characteristics are transmissible and capable of perpetuation through budding.

The degeneration of fiber flax [trans. title], L. Blaringhem (*Compt. Rend. Acad. Sci.* [*Paris*], *179* (*1924*), *No. 7, pp. 418–420*).—Study of a Russian flax having certain characters showing Mendelian behavior (E. S. R., 50, p. 228) led to the conclusion that in order to lessen certain persistent effects of degeneration in this flax when cultivated in France it is necessary to employ lines which are pure and controlled regularly from a genetic standpoint according to the method previously indicated (E. S. R., 46, p. 32; 50, p. 432), and to cultivate this strain in a region having rather weak illumination.

Rate of metabolism and sex determination in Cladocera, A. M. Banta and L. A. Brown (*Soc. Expt. Biol. and Med. Proc.*, *22* (*1924*), *pp. 77–79*).—In studying the effect of various factors on the sex of Cladocera at the Carnegie Laboratory for Experimental Evolution, it was found that crowding of the mothers or treating them with excretory products or other materials tending to lower the metabolic rate resulted in the production of male eggs. It was found that the critical time for influencing sex was during the period of approximately two hours ending about four hours before the egg leaves the ovary. This coincides with the time when the maturation spindle is formed. It is thus concluded that changes in the rate of metabolism of the mother alter the maturation division sufficiently to determine the sex into which the egg will develop.

The production of certain distinct types of reactions by the use of ovarian extracts, G. N. Papanicolaou (*Soc. Expt. Biol. and Med. Proc.*, *22* (*1924*), *pp. 106–108*).—The results of studies of the action on guinea pigs of extracts of various portions of ovaries from cows and sows are reported from the Cornell Medical College. The investigation showed that lipoid extracts of corpora lutea when injected tended to cause a regression of the larger follicles of the ovaries, and that ovulation and the oestrous phenomena were suppressed. Injections of lipoid extracts of the follicular and cystic fluids produced action similar to that described by Allen and Doisy (E. S. R., 52, p. 130). Water-soluble fractions of alcoholic extracts of whole ovaries and corpora lutea tended to stimulate the function of the sexual organs but primarily of the ovary. The extracts of the corpora lutea and follicles were inactive when administered per os, while extracts of the whole ovary had some action when administered in this way.

Studies on vigor.—III, The effect of ovarian extract feeding on the activity of ovariectomized white rats, E. P. Durrant (*Endocrinology*, *9* (*1925*), *No. 3, pp. 221–228, figs. 3*).—The daily activity of 8 ovariectomized and 7 normal female white rats in revolving cages was compared prior to and after the feeding of a glycerin extract of whole pig ovaries. Ovariectomy reduced the amount of activity, and within 20 days the evidence of oestrum had stopped. The feeding of the ovarian tissue had no effect upon the activity even when fed in large amounts three times daily.

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On the number of corpora lutea produced at successive pregnancies by normal and heavily alcoholized mice, E. C. MacDowell and E. M. Lord (*Abs. in Anat. Rec., 29 (1924), No. 2, p. 14*).—The comparative corpora lutea counts for 49 female mice made dead drunk with alcoholic fumes daily for 5 days a week and for 57 litter mate controls are reported from the Carnegie Laboratory for Experimental Evolution. The counts for the controls showed an average of about 8 at the first pregnancy, which gradually rose to nearly 11 at the sixth pregnancy. The treated mice showed a parallel curve which was higher at every point, the difference in each pair being approximately equal to the probable error. It is concluded from these curves that the decline in litter size normally found in mice after the first two or three litters is due to increasing prenatal mortality, and that extreme alcoholization does not cut down the number of ova brought to maturity.

FIELD CROPS

The choice of varieties and stocks of crop plants, J. A. S. Watson (*Highland and Agr. Soc. Scot. Trans., 5. ser., 37 (1925), pp. 55–70*).—The differences between distinct kinds of plant groups termed "variety" are explained, with a discussion of degeneration and reversion, acclimatization and shape of seed, disease resistance, strength of straw, earliness, and quality, and comment on the essential principles underlying the conduct of varietal trials.

Crop sequences at Davis, J. W. Gilmore (*California Sta. Bul. 393 (1925), pp. 3–36, figs. 8*).—The response of wheat, barley, rye, oats, and milo to several rotation practices, including continuous cropping, alternate cropping, and rotation, and various combinations with manure, green manure, and fallow, was studied on Yolo loam and Yolo silt loam at the Davis farm during the period 1914–1923. Climatic conditions and the moisture relations of the soils are discussed briefly. Conclusions based on the experimental data may be summarized as follows:

Continuous cropping diminishes the yield of cereals, and such decrease is augmented with the passage of time. The depressing effect of continuous cropping is especially marked during dry years. Cultivated summer fallow tends to maintain high yields, its principal influence seeming to be due to a more equal distribution of moisture rather than to the total amount conserved. The economy of summer fallow depends on its frequency, the presence of legumes or cultivated crops in the rotation, and the amount and distribution of rainfall. In general, however, yields decline as the period between fallow years is protracted. Manure, if too coarse and if applied too abundantly, may be detrimental, especially during dry years. Its effect is related, among other things, to its composition and to the moisture supply. Green manures of peas and vetch seem to maintain wheat yields at a high level, but the results would indicate that during dry years too much can be added for the best results. The optimum may be about 5 tons per acre.

[Forage crops experiments in Florida, 1919], J. M. Scott, J. B. Thompson, and J. E. Turlington (*Florida Sta. Rpt. 1919, pp. 16–21, 46–49*).—In continuation of previous work (E. S. R., 41, p. 527) are given the results of varietal trials with grain sorghum, sorgo, sugar cane, cowpeas, miscellaneous beans, and cotton, and fertilizer tests with Japanese cane and peanuts. Brief notes on Napier grass, Merker grass, *Chrysopogon monticola*, and toda grass (*Andropogon foveolatus*), are also included.

[Field crops work in Tennessee, 1924] (*Tennessee Sta. Rpt. 1924, pp. 7–19, 32–34, figs. 26*).—Supplementing a previous report (E. S. R., 52, p. 528), these pages briefly describe and illustrate the results of breeding work with

corn, cotton, and lespedeza, fertilizer trials with cotton, pasture experiments, and the eradication of the wild onion. The superiority of soy beans to velvet beans in mixture with corn and of home-grown red clover seed to European seed, the excellent behavior of soy beans on acid soil, and the adverse effects of cutting sweet clover in the fall for hay are discussed.

[**Agronomic investigations in the Virgin Islands, 1924**], J. B. THOMPSON and M. S. BAKER (*Virgin Islands Sta. Rpt. 1924, pp. 5–8, 16–18, figs. 2*).—Further experiments (E. S. R., 51, p. 833) included trials of honavist beans, mung beans, butterfly pea, vetch (*Cracca cathartica*), and sunn hemp. Hairy Peruvian was markedly superior to common alfalfa.

Sweet potatoes made a striking response to manuring, with Key West leading the varieties in acre yield. In all station experiments manure has tended to increase vine growth but to decrease yield of roots. Sets of Black Rock, planted at 18- and 24-in. intervals in the row produced, respectively, 14.5 and 15.9 per cent less weight with increases of 22.3 and 52.4 per cent in the size of roots, as compared with 12-in. intervals. Many seedling sweet potatoes have surpassed the parents in yield, and some are quite promising.

The history and status of the sugar industry in St. Croix are reviewed briefly. Sugar cane treated with paper mulch tillered much more freely and made noticeably better growth than the controls.

[**Field crops work in Montserrat, 1921–22, 1922–23, and 1923–24**], F. WATTS and H. M. LEAKE (*West Indies Imp. Dept. Agr., Montserrat Agr. Dept. Rpt., 1921–22, pp. 3–7, 10, 11, 14–18; 1922–23 and 1923–24, pp. 4–17, 21–23, 24–27, 31–36, pls. 3*).—The progress of earlier investigations and activities (E. S. R., 50, p. 28) is reported on, special attention being given the behavior of cotton selections, the inheritance of boll loculi, and flowering and bolling in cotton. Sugar cane experiments have been noted elsewhere (E. S. R., 53, p. 837).

[**Field crops experiments in Northumberland County, England**], D. A. GILCHRIST (*Northumb. Co. Ed. Com. Bul. 37 (1925), pp. 10–63*).—Report is made of the progress of agronomic investigations (E. S. R., 52, p. 529) at the County Experiment Station at Cockle Park.

[**Report of the] Scottish Society for Research in Plant-breeding**, M. DRUMMOND (*Scot. Soc. Research Plant Breeding Rpt., 3 (1924), pp. 35, pls. 2*).—Investigations reported on in continuation of previous work (E. S. R., 52, p. 227) dealt with hybrids, pure lines and varieties of oats, and inheritance of panicle type; varieties of wheat and barley; varieties, seedlings, hybridization, and wart studies of potatoes; phenotype crossing with perennial rye grass; fertility studies with perennial rye grass, cocksfoot (orchard grass), and timothy; and line selections, controlled seedings, yield tests, singling, and technique of fertility studies with swedes and turnips.

[**Agronomic and plant breeding investigations in Bombay, 1923–24**], W. BURNS and R. K. BHIDE (*Bombay Dept. Agr. Ann. Rpt., 1923–24, pp. 141–161*).—Research (E. S. R., 52, p. 830) continued under the direction of Burns dealt with the control of canal weeds, pure lines and hybrids of safflower, grasslands, and breeding, storage, and disease control with potatoes. Improved selections and hybrids of rice and of wheat were studied under the direction of Bhide.

Additional data showed that *Potamogeton perfoliatus*, the worst canal weed, thrived better on a silt bed than other substrata. Canals differed markedly in their silting capacity and corresponding weed growth, indicating that the canals need individual treatment. Silt deposit and silt suspended in water constitute the present problem.

Close study of spear grass (*Andropogon contortus*) showed at least two definite varieties, and that the hygroscopic twisting of the awn in presence of water helps bury the seed.

Application of sodium arsenite solution on lantana stumps, followed by a layer of castor oil to prevent evaporation, was effective on about 25 per cent of the stumps. Where there was definite blackening due to the entrance of the poison no sprouting was observed.

Hairless plants of pearl millet (bajri) again showed superiority in yield and size of head and in resistance to Sclerospora.

A progress report on forage crop investigations at the Lamao Experiment Station, Lamao, Bataan, F. G. Galang and P. L. Paulino (*Philippine Agr. Rev., 18 (1925), No. 1, pp. 3–31, pls. 9, fig. 1*).—Extensive experiments with forage crops at Lamao and other localities showed that many valuable foreign forage grasses can be grown profitably in the Philippine Islands. The highest yielding forage grasses in order of importance were Napier, Uba cane, guinea, and Guatemala grasses. Disregarding palatability at different cutting stages, Napier and guinea grasses should probably be cut when from 60 to 75 days old to obtain maximum yields by weight, Guatemala and Para grasses at 60 days, Dallis grass at from 20 to 60 days, Cayenne grass at from 60 to 90 days, Bungalon grass (*Homalocenchrus hexandrus*) at from 30 to 90 days, and Uba cane at 90 days. Considering palatability, cuttings should be made every 20 days for guinea, Cayenne, Dallis, and Para grasses, Napier grass 30 days, Guatemala grass 60 days, Uba cane 90 days, and from 30 to 90 days for Bungalon grass. Considering the percentage of the rejected portions Bungalon is the most palatable grass among the species tested, followed in order by Guatemala, Para, and Dallis grasses. Guinea and Napier grasses and Uba cane are relished by livestock, but much of the forage is rejected when the grasses are too old. *Ixophorus unisetus, Pennisetum setosum,* and Merker grass may also prove as palatable as the other grasses, except Bungalon.

Irrespective of the cutting ages, Napier, Guatemala, Cayenne, Dallis, and Para grasses should be spaced 1×0.25 meter, guinea grass from 1×0.25 to 1×0.55, and Bungalon grass 1×0.25 to 1×0.4 meter apart. Cuttings should be employed in planting Uba cane, and Napier, Bungalon, Para, and Cayenne grasses, and *P. setosum,* and rootstocks used of guinea, Guatemala, Dallis, Merker, and jaragua grasses, and *I. unisetus.* Plantings should be made during the rainy season.

Sorghum yielded more fodder than ragi, millet, and adlay, but it must be cut before flowering to be palatable. Cowpeas made better hay than soy beans, cadios, and mung beans. Manimanihan (*Alysicarpus vaginalis*) gave the highest yield among the legumes except cowpeas and mung beans. Both the seeds and the cuttings of manimanihan germinate with difficulty.

Colsess barley, D. W. Robertson and A. Kezer (*Colorado Sta. Bul. 303 (1925), pp. 3–11, figs. 6*).—Colsess, a new 6-rowed, hulled, hooded barley, was derived from a cross between Coast and Success barleys made by D. W. Frear in 1911. The results of comparative tests showed Colsess barley to outyield all other hooded varieties tried under irrigation and to yield as high as Coast and Hanna. It stands up better under irrigation than any other variety tested, in this respect far excelling the other hooded barleys. Colsess shatters less than Coast or Success, thus reducing a serious loss. Colsess is one of the earliest, high-yielding barleys in the region and is well adapted to mountain agriculture. It can be grown for hay, in mixtures with peas for forage, and for grain.

The effect of a varying moisture supply upon the development and composition of the maize plant at different periods of growth, M. F. MILLER and F. L. DULEY (*Missouri Sta. Research Bul. 76 (1925), pp. 3–36, figs. 14*).—Corn plants were grown in potometers on a fairly fertile creek bottom soil of a coarse silt loam texture and received all possible combinations of optimum (28 per cent) and minimum (13 per cent) moisture during 90 days of growth, which were divided into three 30-day periods. Dry weights were obtained and chemical analyses were made for roots; stalks, tassels, and shanks; leaves; and ears. An earlier study dealt with the effect of a varying supply of nutrients (E. S. R., 45, p. 826).

The moisture supply during the second period, or from the time the plants set their ninth leaves until about tasseling time, had by far a greater effect upon the total dry weights of the plants than the moisture supplies during the first and third periods, which were about equal. Corn plants almost completely recovered from the effects of drought at the beginning of the season and produced good yields provided moisture was at optimum after the first month, although maturation was prolonged somewhat.

Low moisture content during the last period gave a greater root development than optimum soil moisture. In all periods minimum moisture gave a greater root growth in proportion to tops than did optimum, even though the actual weight was less during early growth. The stalk growth was affected very little by changes in soil moisture during the last period except where the plants received optimum moisture in this period preceded by minimum moisture. In growth the leaf responded more readily to changes in soil moisture content than did any other plant part, being stimulated whenever the moisture content was optimum. Grain production depended more than any other plant character upon plentiful moisture during the last growth period. Plants grown for only one or two periods showed very strikingly the advantage of an optimum water supply during early growth.

At the end of the first period plants receiving optimum moisture had about three times as much leaf surface as those receiving minimum moisture. At the end of the second period the leaf area of plants receiving optimum moisture during both periods was only about 50 per cent greater than those receiving minimum moisture and at the end of the third period only 18 per cent greater.

The units of water transpired in the production of one unit of dry matter in the tops of the plants varied greatly from year to year according to the season, averaging 216 in 1915, 347 in 1916, and 258 in 1919.

As an average of all cases minimum moisture content produced higher nitrogen and mineral contents than where optimum moisture was applied during any period of growth. The percentage of both nitrogen and mineral elements usually decreased with the age of plants. In general, the decrease was more marked with optimum than with minimum moisture treatments.

Production of Acala cotton in the San Joaquin Valley of California, W. B. CAMP (*U. S. Dept. Agr., Dept. Circ. 357 (1925), pp. 24, figs. 15*).—Cultural and field practices and irrigation methods considered suitable for the production of Acala cotton in the San Joaquin Valley are detailed, with discussion of variety and seed problems, picking methods, and precautions to be observed in ginning.

A jassid-resistant cotton, L. WORRALL (*Union So. Africa Dept. Agr. Jour., 10 (1925), No. 6, pp. 487–491, figs. 3*).—Supplementing an earlier report (E. S. R., 50, p. 436), there is described a Coimbatore selection (No. 295) of Cambodia cotton, the outstanding characteristics of which are the extreme hairiness

of the stem, leaves, and involucral bracts of the plant, and its absolute immunity to jassid injury. It has lint 1⅛ in. long.

Cotton-breeding in the low veld, F. R. PARNELL (*Union So. Africa Dept. Agr. Jour., 11 (1925), No. 2, pp. 153–158*).—This report gives additional information on the jassid resistance of cotton varieties in South Africa.

The bacterial deterioration of cotton during damp storage, A. C. BURNS (*Jour. Textile Inst., 16 (1925), No. 6, pp. T185–T196, pl. 1, figs. 2*).—Sakellaridis cotton was stored in the open and in confined air at Cairo "in seed," in bags, and ginned in bags and in small pressed bales. The effects of sun drying and ventilation were also considered.

Bacterial and fungoid infection, as a source of serious deterioration of cotton during damp storage, is to be sought and controlled in unginned rather than in ginned cotton. Cotton exposed to very damp storage prior to ginning resists bacterial or fungoid attack during subsequent normal storage much less than cotton stored under dry conditions from picking to ginning. Ventilation during storage in seed represses possible bacterial and fungoid deteriorative processes only where the damp material is able to dry out rapidly. Otherwise such ventilation may lead to slightly increased deterioration of the cotton. Sun drying of the cotton is advocated in addition to ventilation, particularly before storage in seed and before baling after ginning. Damping cotton before or during baling is not advised.

The British Cotton Growing Association: Twentieth Annual Report (*Brit. Cotton Growing Assoc. [Pub.] 87 (1925), pp. 55, pls. 12*).—The activities of the association are reported on for the year 1924, with summary accounts of the cotton industry in British colonies and possessions.

Preliminary notes on manila hemp, R. O. BISHOP and E. A. CURTLER (*Malayan Agr. Jour., 13 (1925), No. 5, pp. 125–138*).—Examination of fibers from plants of *Musa textilis* from the experimental plantation, Serdang, and from Sarawak, and standard samples of abacá fiber from the Philippine Islands suggested that pending further experiments it is not yet possible to advocate the commercial cultivation of *M. textilis* in Malaya. The initial work has not produced a fiber as good as that obtained in British North Borneo, which again is inferior to the "prime" abacá produced in the Philippine Islands.

Kapok and its uses (*Buitenzorg: [Dutch East Indies] Dept. Agr., Indus. and Com., Div. Com., 1925, pp. 35, figs. 20*).—A popular English treatise dealing with the characteristics of kapok (*Ceiba pentandra*), its production in Java, and marketing practices, statistics, and agencies.

The relation of inoculation to quality and yield of peas, A. L. WHITING (*Jour. Amer. Soc. Agron., 17 (1925), No. 8, pp. 474–487, figs. 4*).—Experiments carried on by the Wisconsin Experiment Station and demonstrating beneficial results from inoculation of canning peas have been reported in detail from another source (E. S. R., 52, p. 734).

The influence of the type of winter storage of seed tubers on the condition and yield of potatoes [trans. title], H. C. MÜLLER, E. MOLZ, and K. MÜLLER (*Deut. Landw. Presse, 51 (1924), No. 11, pp. 113, 114*).—Seed potatoes were carried through the winter in moderately warm or heated rooms, with restricted respiration of carbonic acid gas and with free access to air, in sacks and in metallic containers, in a warm winter storage with a short cool period, in the usual pit storage, and buried 25 cm. (10 in.) deep in the soil in the open.

The best stands and the highest yields were obtained from seed tubers stored in the usual outdoor pits or stratified in the soil. Warm winter storage promoted reduction of yield and degeneration, but a short cold period seemed

to reduce these adverse effects. Accumulation of respired carbonic acid was very prejudicial to the health and yield of tubers. In field tests, normally stored tubers planted April 19, May 1, and May 17 produced, respectively, 51.2, 49.3, and 36.3 kg. of tubers per unit area and the potatoes stored in a heated laboratory 45.1, 38.7, and 32.3 kg. With pits in hard soil the authors recommend ventilation through the bottom of the pile. Connection with the outer air through the straw layers makes it possible to eliminate the respired CO_2.

The relation of nitrogenous and potassic fertilizers to the solanine content of the potato [trans. title], T. Sabalitschka and C. Jungermann (*Pharm. Ztg., 70 (1925), No. 17, pp. 272–274*).—Kaiserkrone and Rote Rose potatoes were fertilized, respectively, with different amounts of ammonium nitrate and of potassium sulfate. Analyses of the resultant crops showed that nitrogen fertilization did not affect the solanine content of the tubers, whereas potassium, particularly the heavier applications, tended to increase the solanine content. However, it is considered improbable that ordinary applications of nitrogenous and potassium fertilizers will so increase the solanine content as to render the tubers unfit for human consumption. Various aspects of the solanine problem are discussed briefly.

Rye numbers [trans. title] (*Illus. Landw. Ztg., 45 (1925), Nos. 29, pp. 351–365, figs. 17; 30, pp. 367–372*).—The first number includes the following articles on rye, the translated titles of which are The Significance of Rye in German Political Economy, by F. von Lochow; Problems of Winter Rye Culture in Germany, by Zörner; Rational Rye Culture, by Laube; The Practice of Rye Production, by D. H. von Bismarck; Diseases and Injuries of Rye, by K. Ludwigs; Possibilities of Inbreeding in Rye, by C. Fruwirth; Importance of the Rye Seed Stock, by Opitz; and Use of F_1 in Practical Rye Culture, by W. Rudorf. The second number includes The Importance of Rye as a Bread Grain, by M. P. Neumann; Fertilizer and Varietal Problems of Rye, by W. Dix; Rye Culture in the Rot Valley, by Rubwandl; and Original von Rümker Winter Rye, by K. von Rümker.

Variations in the sugar content and growth rate of sugar beets due to differences in rainfall [trans. title], J. Urban (*Ztschr. Zuckerindus. Čechoslovak. Repub., 49 (1925), Nos. 39, pp. 299–306, fig. 1; 40, pp. 307–312*).—About 6,200 industrial analyses were made during 5 years on sugar beets harvested in August and September in Czechoslovakia. Besides the sugar content, the weights of roots and foliage and the rainfall of the preceding week were recorded.

Consideration of the data showed the greatest increase in sugar content to occur in a dry week preceded by a rainy (20 mm.) week, the increase in sucrose in such case averaging 0.8 per cent. The increase in a dry week following a dry week averaged 0.75 per cent. With increasing rainfall, the weekly gain in sucrose content declined regularly so that when the weekly rainfall averaged 27 mm. (1.06 in.) the content remained the same as in the previous week. With yet heavier rainfall the sucrose percentage decreased slightly. Rain averaging lighter than 27 mm. may cause a reduction in sugar content when the root has but little juice and the leaves are withered.

The reduction of sucrose caused by abundant rains (35 mm.) averaged 0.11 per cent, whereas in 1921, a dry year, it amounted to 1.12 per cent. The better development and freshness of the leaves accompanied greater stability in the sugar content. Contrariwise, the drier the beet is the more easily the sucrose content falls after rains because of dilution of the juice and enfeebled assimilation in rainy weather.

The rate of development of the root in a week varies directly with the rainfall in the same or preceding week. The least growth observed, 20.7 gm., occurred during a dry week following a dry week. With increasing rains the additions to the root growth also rise but with a gradually decreasing rate. The maximum average weekly accretion, 38.3 gm. was determined during a sunny period, after a rain of 37 mm.

Maximum elaboration of sugar in the root is effected in a dry week preceded by a rainy week, under which conditions the average weekly gain in sugar has been 7.62 gm. In a rainy week sugar production so decreased that in the course of rain totaling 35 mm. the weekly gain in sugar was only 4.89 gm., i. e., 64 per cent of the maximum production.

Economy in harvesting sugar-beets, G. Stewart (*Utah Sta. Circ. 57* (*1925*), *pp. 8*).—A method of making sugar beet top silage is outlined, and ways of preventing losses in beet tonnage during harvest are suggested. Experiments cited recommend topping as soon as possible after pulling and hauling soon after topping. Beets left in the field for a few hours should be thrown into rather large piles, and when left more than a few hours, covered well with tops. Leaving part of the crown on beets causes loss to farmer and factory.

Sugar beet from field to factory, R. N. Dowling (*London: Ernest Benn, 1925, pp. 72, figs. 8*).—An outline of the sugar beet industry giving information applicable to growing and handling the crop in Great Britain.

Student's method and Student's tables in field experiments with sugar cane [trans. title], P. J. Van Breemen (*Arch. Suikerindus. Nederland. Indië, Meded. Proefsta. Java-Suikerindus., 1925, No. 4, pp. 125–168*).—The application of Student's method[1] and tables (E. S. R., 50, p. 827) to the results of field experiments with sugar cane is discussed, with examples of their use in actual field trials in Java.

Handling cane tassels for breeding work, J. A. Verret et al. (*Hawaii. Planters' Rec., 29* (*1925*), *No. 1, pp. 84–94, figs. 5; also in Facts About Sugar, 20* (*1925*), *No. 27, pp. 638–640, figs. 5*).—Placing the cut end of a sugar cane stalk, with or without a tassel, in a solution of sulfurous acid (1 : 2,000) kept the cane alive in apparently normal condition for several weeks. Microscopic examination showed that pollen from tassels cut for a week or 10 days did not differ from pollen from fresh tassels. Germinations were obtained from pollen taken from a tassel cut 5 days before. The cut tassels kept in the sulfurous acid solution developed normally.

A 5 per cent solution of SO_2, prepared by slowly bubbling the gas through water, is diluted 1 : 100 cc. of water as needed. From 2 to 4 ft. of cane can be left with each tassel, the cut end being placed in water immediately after cutting. After arriving where it is to be used, one joint is cut off under water and the tassel is placed at once in the solution, where it remains continuously.

A questionnaire on [sugar cane] seedling propagation, H. F. Hadfield (*Assoc. Hawaii. Sugar Technol. Rpts., 2* (*1923*), *pp. 55–74*).—The favorite cane varieties and seedlings growing on the different Hawaii plantations included Yellow Caledonia, Lahaina, and H. 109 for lowlands, and for highlands D. 1135, Yellow Tip, and Yellow Bamboo. Correlation was not found between quickly germinating seedlings and high tonnage. The ratooning qualities of a seedling cane seemed more important than its plant qualities in selection. The seedling plat probably should be ratooned and not plowed up after the first selection. From about 12 to 18 months seems the proper age to select seedlings. Large and medium sticks appeared to be superior to a large number of thin sticks. Erect canes are preferred, except for dry lands. Medium and large

[1] Biometrika, 6 (1908), No. 2–3, pp. 302–310.

leaves are generally desired, narrow leaves being held conducive to weakness. Early tasseling is generally considered to be undesirable.

Single point vs. double point seed for sugar cane, S. ASUNCION and M. MEDINA (*Philippine Agr. Rev., 18 (1925), No. 1, pp. 39–44, figs. 2*).—Selected single point sugar cane (Negros Purple) cuttings germinated better at La Carlota Experiment Station than unselected double point and gave more, taller, and larger stalks per stool. The double point produced more fiber and sucrose and showed higher purity than the single, with consequently more sugar per ton of cane, whereas the single point gave 17.9 per cent more tonnage yield and 11.3 per cent greater sugar production than double point. From the preparation of the land until final cultivation single point cost ₱11.90 per hectare ($2.40 per acre) less than double point, and after the harvest the total net gain from single point was estimated to be ₱62.69 more per hectare than from double point.

A field test of thirty-five sugar cane varieties at Del Carmen, Pampanga, M. L. ROXAS (*Sugar Cent. and Planters News, 6 (1925), No. 4, pp. 198–217, figs. 10*).—Consideration of quality, tonnage, sugar yields, and susceptibility to diseases and crop pests showed the following varieties to lead in order of merit: C. A. 12735, Hawaii 109, Queensland 429, Louisiana Striped, Yellow Caledonia, C. A. 15723, New Guinea 24 B, Chinois, Badila, and C. A. 13727.

Sweet clover, R. A. DERICK (*Canada Dept. Agr. Pamphlet 56, n. ser. (1925), pp. 15, fig. 1*).—Experiments at the Brandon, Man., Experimental Farm have indicated early, shallow (1 to 2 in.) seeding of sweet clover, preferably with one of the common cereals as a nurse crop. Wheat seeded 5 pk. per acre as a nurse crop with from 10 to 15 lbs, of sweet clover appears to give satisfactory results. Nurse crops have been economical and are said to have minimized winterkilling.

Second year growth was cut first at 4- and 7-in. heights in early bud formation and 4, 7, and 10 in. high with 75 per cent of terminal buds formed and when 35 per cent in bloom and again at 4 in. high in these growth stages. A general increase in yield with a gradual decrease in percentage of leaf was fonnd as the crop became more mature. The results suggest that if a second crop is wanted, the stubble should be cut high enough to avoid injuring the lower shoots or buds with consequent reduction of yield. If the first crop is cut early, or during bud formation, it seems inadvisable to cut the stubble higher than 5 in. However, if the crop stands much longer than the bud-formation stage, the yield of the second crop will be in direct proportion to the height at which the stubble is cut and will likely be small. The agricultural value, uses, and varieties of the crop are discussed briefly.

Tobacco culture, with special reference to South African conditions, H. W. TAYLOR (*[Johannesburg]: South Africa Central News Agency, 1924, pp. 176, pls. 51*).—The principal facts relating to tobacco production in South Africa are assembled in this volume, together with pertinent information from other countries. Chapters deal with botany and history, distribution and commerce, production areas and practices, tobacco types, insect pests, diseases, and marketing customs.

The tobacco industry (*New York: Chas. D. Barney & Co., 1924, pp. 88, figs. 4*).—The historical, agricultural, manufacturing, economic, and financial aspects of the tobacco industry are dicussed, with a brief account of affiliated industries and statistical data on different tobacco companies.

Sweat in grain and flour, C. H. BRIGGS (*Northwest. Miller, 143 (1925), No. 8, pp. 753, 754, 780, fig. 1*).—The sweating in harvested grain, which appears to be the conclusion of the ripening process, is considered at length, the dis-

cussion dealing with sweating in the stack and the bin, the difference between sweating and heating, the conditions favoring sweating, and the effect of the process on the weight, color, and milling quality of grain and the quality of flour and bread.

Seeds: Their tricks and traits, W. CROCKER (*Jour. N. Y. Bot. Gard., 26 (1925), No. 308, pp. 178–187*).—A résumé of longevity studies touching upon dormancy in seeds of *Nelumbo nucifera* (E. S. R., 51, p. 39), legumes, cocklebur, water plantain, rose, wheat, and corn, and miscellaneous crop, tree, and weed seeds.

The determination of the origin of agricultural seeds with special reference to red clover, F. T. WAHLEN (*Sci. Agr., 5 (1925), No. 12, pp. 369–374*).—Literature on the subject is reviewed, with comment on the characteristics of red clover seed of Canadian origin.

Suggestions for the certification of seeds of some field crops, T. K. WOLFE, L. W. OSBORN, and J. R. FAIN (*Jour. Amer. Soc. Agron., 17 (1925), No. 8, pp. 500–508*).—This summary of a report on seed certification rendered to the Association of Southern Agricultural Workers defines elite, registered, and certified seed, gives rules for inspection, cleaning, and selling, and outlines the requirements for certification of seed of cotton, corn, other cereals, soy beans, cowpeas, velvet beans, and peanuts.

Testing and registration of seeds [in Scotland, 1923–24] (*Scot. Bd. Agr. Rpt., 13 (1924), pp. 56–64*).—The germination and purity of 8,053 samples of agricultural seed tested during the period ended July 31, 1924, are described, and tests of the permanency of strains of perennial rye grass and of red clover are reported briefly.

Report of the Fourth International Seed Testing Congress (*London: Govt., 1925, pp. 227, pls. 2, figs. 3*).—The proceedings of the conference held in Cambridge, England, during July, 1924, are reported in English, German, and French. Among the papers presented were The Work of the Official Seed Testing Station for England and Wales, by A. Eastham; The Work of the European Seed Testing Association, 1921–1924, Germination Tests in the Laboratory and in Soil of Cereal Seed Which is Not "Germinating-Ripe," and Examinations of the Occurrence and Vitality of Various Weed Seed Species under Different Conditions Made at the Danish State Seed Testing Station during the Years 1896–1923 (essentially a summary of an earlier report (E. S. R., 25, p. 335), with supplementary findings), all by K. Dorph-Petersen; Uniformity in Seed Testing Reports, by T. Anderson; The Determination of Moisture in Seeds, by Y. Buchholz (E. S. R., 53, p. 638); Report of the Dodder Committee, and The Longevity of Seeds, both by A. von Degen; Germination Tests at Low Temperature, with Particular Reference to Seeds Which Are Not Fully After-ripened, by W. J. Franck; Report on the Determination of Provenance of Clover and Grass Seeds, by A. Volkart; New Methods for the Determination of the Origin of Seed (E. S. R., 52, p. 535), by G. Trytl; The Evaluation of Hard Seeds, by E. Brown; On the Questions of Hard Husk in Clover Seed and of Broken Seeds, by G. Pammer and J. Schindler; Determination of the Botanic Identity of Varieties in Laboratories and in Experimental Fields, by F. Chmelař; The Work of the Association of Official Seed Analysts of North America, 1921–1924, by M. T. Munn; The Determination of Plant Diseases Transmitted by Seed, by G. Gentner; and Investigations of Agricultural Seeds with Special Reference to Conditions in Japan, by M. Kondo.

Weeds in the fields, gardens, and lawns, C. P. BULL (*Minn. Dept. Agr. Bul. 43 (1925), pp. 138, figs. 83*).—This manual points out the damage caused by weeds, describes their dissemination, discusses the occurrence of weed seed in

cereals and other farm crops in Minnesota, and outlines general control methods. Information is included on the characteristics and range of the principal weeds in the State and suitable eradication practices.

Weeds of Cuba [trans. title], J. C. T. Uphof (*Rev. Agr., Com. y Trab.* [*Cuba*], *7* (*1925*), *No. 5, pp. 5–13, figs. 16*).—Plants described as the most common weeds in central Cuba, some of which are very detrimental to crops, include *Cyperus rotundus*, Bermuda grass, Johnson grass, *Cenchrus echinatus*, *C. carolinianus*, *Chaetochloa imberbis*, *C. verticillata*, *Echinochloa colona*, Para grass, Natal grass, purslane, *Amaranthus viridis*, *Kallstroemia maxima*, *Tribulus cistoides*, *Sida carpinifolia*, *S. acuta*, *S. rhombifolia*, *Euphorbia hypericifolia*, *Dychrostachys nutans*, *Mimosa pudica*, *Aeschynomene americana*, *Flaveria trinervia*, *Parthenium hysterophorus*, *Tridax procumbens*, *Bidens leucantha*, and *Xanthium strumarium*. Control methods are outlined briefly.

The wild oat (Avena fatua) [trans. title], A. Maupas (*La Folle Avoine. Guinarthe, near Sauveterre* (*B.-P.*), *France: Author*, [*1925*], *pp. 32, figs. 2*).—The germination, development, and dissemination of wild oats are described, and control methods are outlined with comment on regions heavily infested, damage caused by the pest, and botanical characters useful in control.

Agricultural practices appearing to impede the progress of the wild oat include (1) the use of a suitable rotation which omits cereals on infested land for a period. alternating winter fallow with cultivated crops and certain forages (when wild oats are eliminated, cereal culture may be resumed if care is taken that the winter cereals are preceded by an appropriate cultivated crop and spring cereals by a winter forage or again by a winter fallow); (2) use of winter and spring fallow (6 months) on clay soils; winter fallow (4 months) on loose soils; (3) substitution of ordinary plowing of the stubble by seeding forages after July on the stubble of infested grain, following the removal of the forage by working up fallow in November; (4) the use of well-cleaned seed; (5) thick seedings of cereals; (6) infrequent change of share croppers; (7) mowing down while green heavily infested cereals; (8) the weeding of slightly infested grain; and (9) the mechanical cultivation of cereals in regions with rather dry springs.

Germination of the seeds of wild oats [trans. title], A. Maupas (*Prog. Agr. et Vit.* (*Ed. l'Est-Centre*), *46* (*1925*), *No. 11, pp. 254–259*).—The author emphasizes the beneficial effect of cold or alternate freezes and thaws, direct or indirect mutilations, shallow tillage, liming, and cutting the infested cereals at 30 or 40 cm. (12 to 16 in.) heights with subsequent burning of the standing culms, in stimulating rapid germination of wild oats so that they may be controlled by cultivation or smother crops.

Experiments in weed control [trans. title], P. Bolin (*Meddel. Centralanst. Försöksv. Jordbruksområdet* [*Sweden*], *No. 275* (*1924*), *pp. 85, figs. 2*).—Comparison of different methods for suppressing weeds made at the Swedish Agricultural Experiment Station in 1923 gave results confirming earlier investigations.

Chemical sprays were effective in destroying annual weeds in growing crops and arresting the growth of most hardy perennial weeds and generally increased crop yields to some extent. Leading among sprays were a 3.5 per cent solution of sulfuric acid and a 20 per cent solution of iron sulfate applied at rates of 1,200 and 600 liters per hectare (128.2 and 64.1 gals. per acre), respectively. The acid spray is easier and more cheaply prepared, acts quicker in good weather, and is more certain with well developed and abundant weeds, but it has a slightly adverse effect on the more tender crop plants.

Sinapis arvensis, *Brassica campestris*, *Raphanus raphanistrum*, *Galeopsis tetrahit*, and *G. versicolor*, especially, and to a lesser extent *Polygonum lapathifolium*, *P. convolvulus*, *Thlaspi arvense*, *Myosotis arvensis*, and *Viola arvensis* may be eliminated if sprayed before the plants have put forth more than three or four leaves, or their growth may be suppressed and seed setting largely prevented even though sprayed after they have begun to bloom. While *Spergula arvensis*, *Stellaria media*, and *Fumaria officinalis* may not be quite destroyed, their growth is retarded enough to permit the crop to dominate the weeds. *Chenopodium album* is practically impervious to the sprays.

Of the commonest perennial weeds, *Taraxacum officinale* and *Tussilago farfara* are most affected by the sprays, *Cirsium arvense* considerably injured, *Sonchus arvensis* very slightly affected, and *Agropyron repens* unharmed.

Hoefer's weed powder, a mixture of pulverized iron sulfate and plaster of Paris, and calcium cyanamide as a rule were not so effective as the liquid sprays. However, calcium cyanamide was very effective against dandelions in meadows and on lawns.

Harrowing did not control annual weeds quite so well as spraying. Working up the earth into drills in the spring or, still better, in the autumn before the field is to lie fallow, is particularly effective against perennials such as couch grass, corn thistle, and coltsfoot. These drills are split repeatedly during the summer fallow, but in order to be effective the summer weather must permit the drills to dry sufficiently. Drilling on fallow fields with deep tillage between the drills after each splitting is still better for destroying perennial weeds, especially corn thistle. By using during the spring tilling corn thistle cutters, special knives fitted on a spring harrow or similar implement, the earth can be cut deep enough (15 to 18 cm. or 6 to 7 in.)

Spraying for weed eradication, W. E. Brenchley (*Jour. Bath and West and South. Counties Soc., 5. ser., 19 (1924–25), pp. 1–20*).—Results obtained in weed eradication by the use of chemical sprays and fertilizers are summarized, with detailed consideration of the effect of copper sulfate, iron sulfate, ammonium sulfate, sodium nitrate, kainit, sulfuric acid, sodium chloride, and calcium cyanamide sprays upon the growth and development of crops and weeds, and of the economic value of spraying with regard to the relative cost of the process and the increase in the crop obtained.

HORTICULTURE

[Horticultural investigations at the Virgin Islands Station, 1924], W. M. Perry (*Virgin Islands Sta. Rpt. 1924, pp. 9–11, 12, 13, 14–16, figs. 3*).—This is the usual annual report (E. S. R., 51, p. 838), consisting for the most part of brief notes on the behavior of various fruits and vegetables. Although tomatoes pruned and staked yielded somewhat better than untreated plants, it is deemed questionable whether the increase was sufficient to justify the cost. In fertilizer tests with citrus, applications containing nitrogen gave uniformly more vigorous growth than combinations lacking in this element.

Productive vegetable growing, J. W. Lloyd (*Philadelphia and London: J. B. Lippincott Co., 1925, 5. ed., rev., pp. XIII+343, pl. 1, figs. 194*).—A revised edition (E. S. R., 50, p. 395) of a text covering the entire field of vegetable production, from the planting of the seed to the harvesting and marketing of the crops.

Kitchen garden and allotment, T. W. Sanders (*London: W. H. & L. Collingridge, 1925, 6. ed., pp. 127, figs. 42*).—A simple guide for outdoor cultivation of vegetables and small fruits in England.

Secondary sex characters in Asparagus officinalis L., W. W. ROBBINS and H. A. JONES (*Hilgardia [California Sta.], 1 (1925), No. 9, pp. 183–202, figs. 6*).—Although staminate and pistillate forms predominate, apparently all asparagus blossoms are potentially hermaphroditic, a condition found to be very rare under California conditions and to be limited to a relatively few blossoms on plants predominately staminate. In respect to sex intergrades, the range included strongly pistillate, weakly pistillate, hermaphrodite, weakly staminate, and strongly staminate flowers. In a large population there was found an approximately equal division of staminate and pistillate plants.

Important differences were found in the earliness of production, total yield, and size of spears in staminate and pistillate plants. Staminate plants reached a blossoming age and produced, during the first and second seasons, a greater number of stalks per crown than did the pistillate plants. However, the average weight of individual stalks was greater in the pistillate plants. In respect to the average height of the first flowering shoots, pistillate plants surpassed staminate plants by approximately 30 per cent. With the weight of berries subtracted, the difference between staminate and pistillate plants in respect to the total green weight of the tops was statistically significant, showing that the staminate individuals had a larger photosynthetic surface for manufacturing food.

Asparagus culture in Argenteuil, E. JUIGNET (*Les Asperges: Leur Culture à Argenteuil. Argenteuil: Author, 1925, 2. ed., pp. 80, figs. 14*).—A small handbook of general cultural information.

Size of seed in tomatoes in relation to plant growth and yields, H. D. BROWN (*Amer. Soc. Hort. Sci. Proc., 21 (1924), pp. 57–60*).—That reduction in the size of tomatoes resulting from unfavorable growing conditions and accompanying leaf infections may have a decidedly reducing effect on the size, viability, and producing power of the resulting seed was indicated in studies carried on by the Indiana Experiment Station in the summers of 1923 and 1924. Seed saved from large fruits ran 348 to the gram, gave 75 per cent germination, and yielded 12.38 tons of fruit per acre as compared with 595 seeds, 68 per cent, and 10.13 tons, respectively, for the heaviest seed taken from the small fruits collected the same day. Apparently plants raised from seed of small sized fruits will, if given the best of care, produce nearly as well as those from large fruits. No consistent differences were noted in the time of maturity of fruit from large or small seed stocks.

A chlorotic condition of pear trees, A. H. HENDRICKSON (*Amer. Soc. Hort. Sci. Proc., 21 (1924), pp. 87–90, pl. 1*).—Spraying at the California Experiment Station in April, 1921, of large chlorotic pear trees with 1, 2, and 5 per cent solutions of iron sulfate resulted, in the case of the 5 per cent solution, in severe foliage burning. Although no injury resulted from 1 and 2 per cent solutions, covering was difficult and required several applications. The insertion of a small amount of ferrous sulfate just inside the cambium layer of the trunk resulted in changing whole or parts of trees from a chlorotic to a normal green color within two or three weeks. The treated branches retained the green color for two succeeding seasons. Success was also obtained in the case of shoots whose cut ends were dipped in solution.

Only slight lateral movement was indicated, since ferrous sulfate inserted below a certain limb usually caused greening of that limb alone. Overdoses of the salt caused the death and abscission of the leaves; and, furthermore, wherever the salt came in contact with the cambium serious injury resulted. The introduction of a 0.1 per cent solution by means of a tube gave favorable results. Scattering crystals on the surface of the ground near the base of

the tree was ineffective, but when the material was placed in trenches dug close to the roots the effects were positive and rapid, especially when water was poured in before closing the trenches.

That the character of the rootstock had a direct effect on chlorosis was indicated in the greater resistance of the ordinary pear (*Pyrus communis*) than in the Japanese pear (*P. serotina*) and quince. Among the varieties most subject to chlorosis were Bartlett, Comice, P. Barry, Winter Nelis, and Glout Morceau. Hardy and Clairgeau were comparatively resistant. Apple, plum, raspberry, blackberry, and English walnut growing in the same type of soil also suffered from chlorosis.

The pedicels, calyx, sepals, and receptacles of the flowers of the peach are valuable characters for identifying varieties of peaches when in bloom and immediately after petal fall, M. A. Blake (*Amer. Soc. Hort. Sci. Proc., 21 (1924), pp. 73–79*).—In this contribution from the New Jersey Experiment Stations, the author discusses the distinguishing floral characters which may be utilized in the identification and classification of peach varieties.

Correlation studies in peach tree response, H. L. Crane (*Amer. Soc. Hort. Sci. Proc., 21 (1924), pp. 20–28*).—A study of data taken in a fertilizer investigation with peaches (E. S. R., 51, p. 537) led to the conclusion that increased trunk circumference is not as positive an index to vigor and fruitfulness as was found by Waring (E. S. R., 46, p. 539) to be the case in the apple. Grouped without regard to fertilizer treatment, the coefficient of correlation (r) for yield and increase of trunk growth for young Elberta trees was 0.383 ± 0.045. Separated according to nitrogen treatments, r in the case of a nonnitrogen group was 0.419 ± 0.068 and for nitrogen-supplied trees 0.403 ± 0.058. Computation of r for total shoot growth and total yield gave 0.433 ± 0.067 and 0.303 ± 0.063 for trees not supplied with and supplied with nitrogen, respectively, indicating that nitrogen had a positive influence in reducing the correlation. From observations on control trees, the author deems it probable that nitrogen decreased the correlation between tree growth and yield by stimulating yield at a relatively greater rate than growth.

However, in general conclusion, it is thought that the length of terminal shoots and the gains in trunk circumference, used alone or in conjunction with yield records, are valuable aids in measuring the response of peach trees to varying fertilizer treatments.

Some observations on the response of peach trees to summer pruning, H. L. Crane (*Amer. Soc. Hort. Sci. Proc., 21 (1924), pp. 28–30*).—That peach trees suffering from nitrogen deficiency, as indicated in yellow leaves, slender growth, and few flowers, make a rapid response to summer pruning was shown in the case of Salway peach trees from which the tips of certain branches were removed in an effort to stimulate fruit-bud formation, etc. Within the brief period of one hour, foliage on the pinched limbs took on a noticeably darker green hue. Microchemical examination of leaves from shoots removed one hour after pinching and placed in a dark chamber showed the tissues of the leaves and the adjacent wood to be congested with starch, while comparable unpinched shoots contained much smaller amounts. After three weeks the excess starch had disappeared, but the dark green color of the pinched shoots remained, sometimes until leaf abscission. The author believes that removing the growing tips caused an accumulation of carbohydrates and nitrogen, the increase of the latter being responsible for the darker green of the foliage.

An experience with pollenizers for cherries, H. B. Tukey (*Amer. Soc. Hort. Sci. Proc., 21 (1924), pp. 69–73*).—Working in a cherry orchard composed

of solid blocks of Windsor, Schmidt, Black Tartarian, and Lambert, the author found in 1924 a normal blossom set of 43.4 per cent in the row of Windsor adjacent to Black Tartarian, as compared with 26.7, 22.9, 16.7, 20.6, 22.5, 23.3, 9.8, and 14.5 for the second to the ninth rows. Hand application of Black Tartarian pollen to trees in the third, fourth, fifth, sixth, and ninth Windsor rows gave percentages of set of 35.2, 37.2, 41.8, 46.1, and 38.7, respectively, indicating that physiological conditions within the trees themselves had no effect in limiting pollination in the open. As a practical suggestion, the author recommends that solid block planting be superseded by mixed plantings, with at least one pollinizer to every nine trees. Further observations showed Lambert, Bing, and Napoleon to be intersterile; Downer to be an ineffective pollinizer for Windsor; and all varieties studied, namely, Napoleon, Lambert, Bing, Windsor, Schmidt, Downer, and Black Tartarian, to be self-sterile.

Studies relating to the handling of sweet cherries, H. Hartman (*Amer. Soc. Hort. Sci. Proc., 21 (1924), pp. 79–86*).—Material herein presented has, for the most part, been previously noted (E. S. R., 53, p. 440).

Experiments with various potassium fertilizers applied to strawberries [trans. title], N. Esbjerg (*Tidsskr. Planteavl., 31 (1925), No. 1, pp. 77–86*).—As a part of an extended investigation to determine the possibility of substituting artificial for natural manures in strawberry culture, a test was made with fertilizers of equal nutritive value but differing in the amount of chlorine contained in the potassium salt. In all cases an increase in the amount of chlorine reduced yields in direct proportion to the amount added. Artificial fertilizers with a small chlorine content slightly increased yields above the control plats on both sandy and loamy soils. Animal manures were invariably more effective than artificials in increasing the yield.

The pruning of injured grapevines [trans. title], L. Ravaz and G. Verge (*Ann. École Natl. Agr. Montpellier, n. ser., 18 [1925?], No. 2–3, pp. 73–88, figs. 4*).—Pointing out that the seriousness of hail injury to grapes is dependent upon two variable factors, (1) the intensity of the hail and (2) the time of its occurrence, the authors discuss experiments in which were determined the effects of pruning in various manners and various times of the year upon the vigor and productivity of the vines.

Only those vines pruned in April and May bore fruits which even approached maturity at the regular harvesting season, a circumstance believed to be due in part to the occurrence of an unusual drought. With vines pruned in the same way, the later the operation was deferred the greater was the reduction in the number and size of new clusters. In the different types of pruning practiced, reduction in fruit was correlated with the increasing number of buds removed. The number and total weight of new shoots produced per vine gradually diminished with delay in the date of pruning. That type of pruning which stimulated the latent buds at the base of the new canes was most successful in respect to both fruitfulness and strong vegetative growth. Observations on the same vines in the succeeding year, when all were pruned in the same manner, showed very marked reductions in the productivity of those pruned late in the preceding year.

Experiments with citrus trees [at the Florida Station, 1919], B. F. Floyd (*Florida Sta. Rpt. 1919, pp. 22–30*).—As indicated by increases in trunk diameter, there was little difference in the relative value of acid phosphate, steamed bone, finely ground pebble phosphate, and soft phosphate as sources of phosphoric acid for young orange and grapefruit trees otherwise well supplied with nutrients. Similar results were attained in the case of older trees which had received regular applications of complete fertilizer previous

to the initiation of the investigation. Based on observations alone, the bearing trees at Lowell failed to show any special response to any one source of phosphoric acid.

Modifications in the ratio of phosphoric acid to potash in complete fertilizers applied to bearing trees at Tampa and Sutherland failed to show any marked difference in favor of any one formula. Similar results were also secured with nonbearing trees. Comparing nitrate of soda with sulfate of ammonia as a source of nitrogen, the average increase in trunk diameter of young trees at Tampa indicated a slight superiority in favor of the sulfate of ammonia. However, the results were rendered questionable by an application of fertilizer applied to an intercrop of cabbages on the ammonia plats.

The lilies of eastern Asia, E. H. WILSON (*London: Dulau & Co., 1925, pp. XIV+110, pls. 17*).—Based on extended travel and study of lilies in their native haunts, in gardens, and in herbariums, the author presents a comprehensive account, listing species and synonyms, presenting keys to the subgenera, sections, and species, and enumerating and describing the same. General suggestions in regard to the cultural requirements of lilies are also included.

Boxwood gardens, old and new, A. A. LEWIS (*Richmond, Va.: William Byrd Press, 1924, pp. 191, figs. 98*).—Discussing the use of boxwoods in various gardens in the United States and abroad, the author, with the aid of abundant illustrations, suggests the decorative value and general usefulness in ornamental work of this old and well-known shrub.

Gardens: Quick results with flowers and vegetables, J. G. COSGRAVE (*New York: George H. Doran Co., 1925, pp. 177, pls. 5, figs. 2*).—A presentation of popular information relating to the culture and utilization of flower, vegetable, and fruit gardens.

FORESTRY

Annual report of the director of forestry of the Philippine Islands for the fiscal year ended December 31, 1924, A. F. FISCHER (*Philippine Bur. Forestry, Ann. Rpt. Dir. Forestry, 1924, pp. 216, pls. 2*).—This is the usual annual report (E. S. R., 52, p. 843) pertaining to the administration of the forests and the Bureau of Forestry.

Administration report of the Forest Department of the Madras Presidency for the year ending 31st March, 1924, I, II, H. TIREMAN ET AL. (*Madras Forest Dept. Admin. Rpt. 1923–24, vols. 1, pp. 4+25+130, pls. 9; 2, pp. 191, fig. 1*).—This, the usual administrative report (E. S. R., 51, p. 751), covers the period ended March 31, 1924, and is presented in two volumes. The first volume consists of a general review of the work of the year and a short summary of progress made during the quinquennium ended March 31, 1924. The second volume consists of reports on the work in the six forest circles for the year, followed by quinquennial reports; an administrative report of the Madras Forest College, Coimbatore, for the year; and a review of the work done by the forest engineering branch up to March, 1924.

Report of the Provisional Forestry Board for the year ended 31st December, 1924, E. H. F. SWAIN ET AL. (*Queensland Forest Serv., Rpt. Provisnl. Forestry Bd. 1924, pp. 38, pls. 9*).—This is the usual administrative report (E. S. R., 52, p. 843).

Investigations of the Douglas fir in Italy [trans. title], A. PAVARI (*Ann. R. Ist. Super. Forest. Naz. Firenze, 9 (1923–24), pp. 101–139, figs. 3*).—Data are presented upon the rate of height, diameter, and volume increment, the proportion of bark to wood, taper values, and the physical and mechanical

characteristics of the wood. Douglas fir, on account of its rapid growth and the high quality of the wood produced, is conceded to be so valuable that the author suggests that large plantings be made of this species.

Observations on the drying of Scotch pine cones in the winter of 1923–24 [trans. title], E. HESSELINK (*Meded. Rijksboschbouwproefsta. Wageningen, 1 (1924), No. 3, pp. 29–37, fig. 1*).—Following complaints from seed extractors upon the unsatisfactory opening of Scotch pine cones, investigations indicated that the position of the trees in relation to the sun during an intensely hot period occurring in July, 1923, was apparently the determining factor. Thirty-eight per cent of the cones from trees exposed directly to the sun did not open, as compared with 1 per cent of the cones from shaded trees.

Practical tree repair, E. PEETS (*New York: Robert M. McBride & Co., 1925, rev. ed., pp. XVII+270, pls. 19, figs. 51*).—A revised edition (E. S. R., 30, p. 236).

Timbers: Their structure and identification, W. S. JONES (*Oxford, Eng.: Clarendon Press, 1924, pp. XI+148, figs. 165*).—Discussing the physical characteristics, histological features, and factors of diagnostic value in timbers in general, the author outlines the principal macroscopic and microscopic features of important European and Indian species.

DISEASES OF PLANTS

Introduction to plant pathology, H. MORSTATT (*Einführung in die Pflanzenpathologie. Berlin: Borntraeger Bros., 1923, pp. VIII+159, figs. 4*).—The four main parts of this book on plant disease deal, respectively, with recognition, pathology, causes, and protection.

Report of the plant pathologist, H. E. STEVENS (*Florida Sta. Rpt. 1919, pp. 31–36*).—The author reports the occurrence of a wilt of castor beans due to *Bacillus solanacearum* and leaf spots of the same plant caused by *Bacillus* sp., *Cercospora* sp., and *Macrosporium* sp. A gray mold due to *Botrytis* sp. is described.

The blossom-end rot (*Alternaria citri*) and blue mold decay (*Penicillium italicum* and *P. digitatum*) on citrus fruits are also noted.

Report of associate plant pathologist, C. D. SHERBAKOFF (*Florida Sta. Rpt. 1919, pp. 37–42*).—Notes are given of a bacterial blight of potatoes caused by *Bacterium solanacearum*, a bacterial fruit rot of cucumbers, and a stem rot of corn, with which a species of Pythium was associated.

A brief account is given of potato spraying with Bordeaux mixture, in which gains of 39 and 51.6 per cent are reported for two field trials on the control of late blight.

[Notes on crops resistant to disease in Tennessee] (*Tennessee Sta. Rpt. 1924, pp. 22–26, figs. 7*).—Brief accounts are given of sweet potatoes resistant to mosaic, of cabbage resistant to yellows, and of tomatoes resistant to wilt.

Plant diseases [Surinam] [trans. title], STAHEL (*Dept. Landb., Nijv. en Handel Suriname Verslag, 1922, pp. 25–31*).—Of plant disorders reported, the one considered as most serious is sugar cane mosaic. Facts and figures regarding a few other diseases are given.

New diseases of Ceylon plants, T. PETCH (*Ceylon Dept. Agr. Yearbook, 1925, pp. 63, 64*).—A list of 29 plants is arranged alphabetically and by gross anatomy, with diseases attacking each part, these organisms being recent additions to those previously reported (E. S. R., 45, p. 843) as found on cultivated plants in Ceylon.

The transmission of a new plant virus disease by insects, H. H. Storey (*Nature [London], 114 (1924), No. 2859, p. 245*).—The author very briefly outlines information given more fully in the paper noted on page 250.

The variegated condition of sugar cane and of a number of graminaceous plants, characterized by a chlorosis of the leaves in narrow broken stripes parallel to the veins and in some cases at least by a lowering of the capacity for growth, has been recognized for many years as a production-limiting factor in coastal and midland areas of Natal, having been reported, it is said, as early as 1901 by Fuller (E. S. R., 13, p. 1062). Similar conditions were found in sugar cane and a number of other grasses. It is a disease somewhat similar to mosaic of various grasses but not identical therewith.

Previous conclusions have been confirmed by the more recent work. The author has shown that some adults of the jassid leafhopper group, that is, of an undescribed species of the genus Balclutha, may carry the disease to healthy plants, but only when passing from those characteristically diseased. All attempts to secure this infection by transference of *Aphis maidis* have failed. *Balclutha* sp. is moreover limited in its ability as carrier, as only a portion of the adult insects can act as carriers, but the insects which have been found to be vectors never fail to transmit the disease to all plants to which they subsequently move.

Preliminary attempts to secure transmission of the disease from maize to sugar cane and grasses have all failed. It appears, though not yet with any certainty, that this is a single disease occurring in different hosts.

Report of the imperial mycologist [Pusa], 1923–24, W. McRae (*Agr. Research Inst., Pusa, Sci. Rpts., 1923–24, pp. 41–51*).—Besides accounts including systematic work, programs, and publications, brief notes are given of plant diseases.

Cereal investigations included continuation of Mitra's work on Helminthosporium (E. S. R., 53, p. 542). On *Hordeum sativum* have been determined *Helminthosporium sativum*, *H. teres*, and *H. gramineum*, and on *Triticum vulgare* have been found *H. sativum* and an undescribed species. Under *H. teres* has been diagnosed as *H. sativum* what was formerly considered a variety. The possible connection between Helminthosporium and a wheat foot rot was investigated with inconclusive results. *Helminthosporium* sp. on *Zinziber officinale* has been brought under culture and investigation. Inoculation experiments gave ready infection of wheat, barley, and oats.

Pythium on Cucurbitaceae has yielded a new strain on *Cucumis sativus* and one on *Trichosanthes dioica*, the strains approximating *P. butleri*.

Jute stem rot work was concluded with apparent identification of two fungi, which have been considered as *Macrophoma corchori* and *Rhizoctonia solani*. Cultures of the sclerotial stage have been pronounced identical with *Sclerotium bataticola*. The systematic position of the fungus is more fully discussed by Shaw in the article noted on page 248. Physiological work on jute diseases, as continued, is outlined.

Pigeon pea (*Cajanus indicus*) wilt problem work, including physiological tests of *Fusarium udum*, was continued. Gram wilt pot culture experiments with the 12 strains of Fusarium previously isolated gave no definite results.

Sugary disease (*Sphacelia sorghi*) of sorghum could not be cultivated on artificial media. From diseased berseem (*Trifolium alexandrinum*) have been isolated one species each of Rhizoctonia, Fusarium, Vermicularia, and Cercospora. From areca nut palms affected by a bud rot, *Thielaviopsis* sp. was isolated in several localities.

Recent additions to fungus parasites of cultivated plants [trans. title], J. B. MARCHIONATTO (*Rev. Facult. Agron. La Plata, 3. ser., 15 (1924), No. 3, pp. 7–21, figs. 6*).—To the list of fungi parasitic on plants of the La Plata region the author now adds *Ascochyta caulicola*, on stems of *Melilotus alba; Cladosporium carpophilum*, on fruits of *Prunus persica* and *P. amygdalus; C. herbarum cerealium*, in leaves of *Secale cereale; Exosporium palmivorum*, in leaves of *Phoenix canariensis; Gloeosporium pirinum*, in leaves of *Pyrus communis; G. rosae?*, in vines and leaves of *Rosa* spp.; *Leptothyrium pomi*, in fruits of *P. malus; Marssonina* (*Marssonia*) *nigricans*, in leaves and branches of *Salix babylonica; Ophiobolus graminis*, in stalks of *Triticum sativum; Phyllosticta magnolia cookei*, in leaves of *Magnolia grandiflora; P. malkoffii*, in leaves of *Gossypium* sp.; *Puccinia graminis avenae*, in leaves of *Phalaris canariensis; Puccinia nigrescens*, in stems of *Salvia splendens; Ramularia primulae*, in leaves of *Primula auricula? ; Sclerospora macrospora*, in a plant not named; *Septogloeum cydoniae*, in leaves of *Cydonia vulgaris;* and *Septoria acanthina*, in leaves of *Acanthus mollis*.

Perithecia of Thielavia basicola Zopf in culture and the stimulation of their production by extracts from other fungi, F. A. McCORMICK (*Connecticut State Sta. Bul. 269 (1925), pp. 539–554, pls. 3*).—The results are given of culture studies with *T. basicola* to determine the connection of various kinds of spores formed by the fungus and also the possibility of its relation to other species reported on a wide range of host plants.

Ascospores were produced in artificial cultures, thus identifying this stage of the fungus. It was found that *T. basicola* has a tendency to produce perithecia when grown alone, but this is greatly stimulated when the fungus is grown with *Thielaviopsis basicola*, with which it is associated in nature. The production of perithecia was stimulated when grown with *Cladosporium fulvum, Aspergillus umbrosus*, Aspergillus of the glaucus type, *Eurotium amstelodami*, and to some extent with *Fusicladium pirinum*. *Thielavia basicola* was likewise stimulated to produce perithecia when treated with water extracts from *Thielaviopsis basicola, T. paradoxa, C. fulvum, A. umbrosus*, and *Saccharomyces cerevisiae*, and with a water solution of Taka-diastase. The evidence secured from the author's investigations with *Thielavia basicola* indicated that this was not the ascospore stage of *Thielaviopsis basicola*, although the two forms are commonly associated.

Control of root-knot nematodes, J. R. WATSON (*Florida Sta. Rpt. 1919, pp. 50, 51*).—For the control of root-knot nematodes in truck soils, the author suggests the application of 600 lbs. of sodium cyanide and 900 lbs. of ammonium sulfate per acre. For seed beds, applications of 800 lbs. of sodium cyanide and 1,200 lbs. of ammonium sulfate are recommended.

Summer fallowing is said to be the most effective method of field control.

Warm seed disinfection treatments [trans. title], M. PLAUT (*Angew. Bot., 7 (1925), No. 3, pp. 153–184, fig. 1*).—Seed treatment tests reported with commercial fungicides at different concentrations and temperatures, as a protection against cereal smut, are deemed encouraging though not yet conclusive.

The influence of temperature on the effectiveness of fungicidal solutions [trans. title], M. PLAUT (*Pflanzenbau* [*Berlin*], *No. 20 (1925), p. 345*).—A concise account of the work detailed in the article noted above.

Cereal seed dry treatment in Hungary [trans. title] (*Pflanzenbau* [*Berlin*], *No. 21 (1925), pp. 364, 365*).—In these tests copper sulfate was exceeded in efficiency by Uspulum and by Porzol I (a colloidal preparation of copper), both of which gave complete freedom from cereal smut, with no lessening of germinability.

Wheat stinking smut control [trans. title], BURK (*Ztschr. Pflanzenkrank., 33 (1923), No. 5–6, pp. 193–240*).—A tabular and descriptive account is given of trials, more or less comparative, on smut control with various steeping compounds.

The more important grain diseases and their control, F. BOAS (*Die Wichtigsten Getreidekrankheiten und ihre Bekämpfung. Freising: F. P. Datterer & Co., 1923, pp. 55, figs. 17*).—This publication deals with the application of the results of scientific research and tests, by workers listed, to means for the protection of grain plants against attacks by both plant and animal parasites.

Studies in diseases of the jute plant.—II, Macrophoma corchori Saw, F. J. F. SHAW (*India Dept. Agr. Mem., Bot. Ser., 13 (1924), No. 6, pp. 193–199, pls. 2*).—In continuation of reports previously noted (E. S. R., 48, p. 47), it is stated that eastern Bengal and Bihar jute is sporadically to epidemically attacked by a rot appearing about or just above the ground level and producing in the early stages a brown discoloration which gradually darkens and spreads until the whole plant wilts. Either *Corchorus capsularis* or *C. olitorius* may be attacked at any stage of growth by the organism, which may be identical with *M. corchori*.

Pea disease survey in Wisconsin, F. R. JONES and M. B. LINFORD (*Wisconsin Sta. Research Bul. 64 (1925), pp. 31, figs. 8*).—A report is given of a detailed survey made in 1924 of 688 pea fields distributed in the pea-growing sections of the State, and a summary is given of the findings of the survey.

The root rot caused by the fungus *Aphanomyces euteiches* was found to be the most serious disease, and it is considered to be indigenous in Wisconsin soils, occuring especially in wet locations. This root rot was found in 32 per cent of the fields examined, and the disease is said to increase both in frequency of occurrence and severity with the number of crops grown. No soil type was found to indicate lessened attack due to this fungus. The root rot was found to persist in some Wisconsin soils for 10 years after it had caused crop failure, and after such failure no fields were found entirely free from the disease in less than 10 years. The variety Green Admiral showed an important degree of resistance to root rot.

A newly observed wilt disease is reported that ranked second in destructiveness to the root rot. Additional diseases briefly reported are a stem and root rot caused by *Fusarium* sp., a foot rot caused by *Phoma* sp., a seedling injury caused by *Rhizoctonia solani*, a leaf and pod spot caused by *Ascochyta pisi*, leaf spots due to *Septoria pisi* and *S. flagellifera*, an anthracnose caused by *Colletotrichum pisi*, downy mildew caused by *Peronospora viciae*, a bacterial blight caused by *Pseudomonas pisi*, and mosaic.

The potato, D. BRICOUT (*La Pomme de Terre. Renaix, Belgium: J. Leherte-Courtin & Son, 1923, pp. 90, figs. 9*).—This brief general treatment includes an account stressing forms of degeneration occurring in potato culture, and means used or proposed to minimize losses.

Diseases and injuries of potato [trans title], H. W. WOLLENWEBER (*Arb. Forschungsinst. Kartoffelbau, No. 7 (1923), pp. 56, figs. 345*).—An outline of sources of injury to the potato crops chiefly in or near Germany includes, besides lesions due to disease organisms, various animal pests.

The use of unripe potato tubers for seed [trans. title], J. O. BOTJES (*Cultura, 34 (1922), No. 405, pp. 173–185; 35 (1923), No. 420, pp. 279–288*).—As a result of studies reported in the two years 1922 and 1923, the author states that the number of mosaic and leaf-roll diseased tubers from originally sound stock is considerably less from early than from late diggings used as seed.

However, it is concluded that infection of tubers may occur early in the summer.

Early digging of potatoes for planting [trans. title] (*Verslag. en Meded. Plantenziektenkund. Dienst Wageningen, No. 32 (1923), pp. 11*).—This review of opinion presents the tabular data by Botjes, noted above.

Transmission of viruses from apparently healthy potatoes, J. JOHNSON (*Wisconsin Sta. Research Bul. 63 (1925), pp. 12, pls. 8*).—During the course of cross-inoculation studies on certain virus diseases of solanaceous plants, the author noted that symptoms were secured on tobacco from potatoes selected as healthy controls, and that these symptoms did not materially differ from those secured when various virus diseases of the potato were used as a source of inoculum. An investigation was made of this matter, and it was found that potatoes which are healthy as far as can be determined show that at least two different viruses are commonly, if not universally, present in most standard varieties of potatoes. When used as inoculating material these viruses produce on tobacco three types of disease, mottle, spot necrosis, and ring spot. The two former may be different expressions of the same disease. It was found that one or more of these viruses could be transmitted readily to a large number of species of solanaceous plants. The spot necrosis form was transmitted back to the potato, where it caused a virulent disease. The mottle and ring spot forms gave no symptoms on potatoes. No other species of healthy plant was found from which the extract would induce symptoms of any kind in tobacco. Potato foliage from true seed also failed to give any definite infection on tobacco. Ordinary tobacco mosaic combined with the virus from healthy potatoes resulted in a combination disease with striking necrotic effects.

In conclusion, the author considers his experimental results to indicate that potatoes are either true carriers of viruses or that potato protoplasm is actually the causal agency of one or more of the virus diseases of tobacco and other solanaceous plants.

Potato leaf curl, H. W. MILES (*Kirton [Lincolnshire] Agr. Inst. Ann. Rpt. 1923, pp. 33–37, figs. 2*).—A potato leaf curling or rolling disease has been under observation for some time at Kirton, and data have been collected regarding varietal susceptibility, the value of roguing, and the recognition of the various stages of the disease in the field. A correlation is noted between leaf curl increase and yield depression. Apparently, aphids and capsids transfer the infective material. Contacts also spread the disease. Tubers transmit the trouble, even in cases where the plants bearing them did not before the end of the season show the disease. Control suggestions include only seed selection, roguing, and complete change of seed at least as often as every two years.

Rhizoctonia disease (hypochnose) of potato and its control [trans. title], K. O. MÜLLER (*Pflanzenbau [Berlin], No. 21 (1925), pp. 358–361*).—All of those seed treatments which were highly effective in controlling potato Rhizoctonia disease limited also the crop returns. Recommendations include quick warming, noncrusting soils, late and not too deep planting, and frequent cultivation.

Supplementary note on the enzyme activity of Rhizoctonia solani Kühn, T. MATSUMOTO (*Bul. Imp. Col. Agr. and Forestry, Japan, No. 8 (1924), pp. 1–13*).—In a previous paper (E. S. R., 50, p. 43) the author expressed opinions concerning the effect of H-ion concentrations on the activity of certain enzymes. The present paper presents additional data, also certain new interpretations.

Verticillium disease of potatoes, H. W. Miles (*Kirton [Lincolnshire] Agr. Inst. Ann. Rpt. 1923, pp. 37–39, fig. 1*).—In 1922, reports were received of potatoes wilting in patches in fields at Bourne and Spalding Marsh, and later at other points, the stems showing underground indications of disease. Phases of the attack, with symptoms described, point to *V. albo-atrum* as the causal fungus. Varieties showing the disease in 1923 were Sharpe Express, Eclipse, Ninetyfold, and May Queen as the early stocks and The Ally and King Edward as the late stocks.

Varietal resistance and susceptibility of sorghums to Sphacelotheca sorghi (Link) Clinton and Sphacelotheca cruenta (Kühn) Potter, G. M. Reed (*Mycologia, 15 (1923), No. 3, pp. 132–143, pls. 2*).—Investigations on the behavior of sorghum varieties to covered kernel smut (*S. sorghi*) and experimentation with loose kernel smut (*S. cruenta*) are reported, and the very different effects produced by these two fungi on their hosts are set forth in a somewhat detailed comparison.

Summarized report on the position in relation to sugar cane mosaic in Reunion, E. F. S. Shepherd (*[Port Louis]: Mauritius Dept. Agr., [1924], pp. 3, pl. 1*).—An inspection tour by the author of the island of Reunion during September and October, 1924, showed sugar cane mosaic to be the most serious and threatening of the several sugar cane diseases then present, although confined almost wholly to the leeward section of the island. The variety Louzier was attacked most readily and most severely, with Port Mackay a close second in both respects, and other varieties variously affected.

The report is preceded by a short account of mosaic in general, more particularly that of sugar cane.

Diseases of sugar-cane of the mosaic type in South Africa.—I, True mosaic, mottling, or yellow stripe disease, H. H. Storey (*Union So. Africa Dept. Agr. Jour., 9 (1924), No. 2, pp. 108–117, pls. 2, fig. 1*).—The author found cane mosaic already present in Natal on his arrival in 1922, although no previously published record exists. The present paper is based on the results of study during 18 months under South African conditions, and deals with symptoms, varietal susceptibility, losses, alternate hosts, transmission, and control of the disease.

Mosaic in Natal attacks all cane varieties except Uba, being characterized by a semitransparent mottling with yellow or pale shades of green and by lessening of growth. The complete eradication of all cane varieties except Uba has been recommended as a practical measure for its elimination.

Streak disease, an infectious chlorosis of sugar-cane, not identical with mosaic disease, H. H. Storey (In *Imperial Botanical Conference, London, 1924, Report of Proceedings. Cambridge: Univ. Press, 1925, pp. 132–144, pls. 2*).—The author describes under the name streak disease an infectious chlorosis of sugar cane in South Africa, no description of which, it is stated, has previously appeared. Unlike mosaic, it appears in the variety Uba, to which, it is said, 99.8 per cent of all the sugar-growing area of Natal is planted, on account of its resistance to mosaic, and with which it has, supposedly, been confused in some instances.

Streak distinctive symptoms are confined to the leaves and are described in some detail. Wild grasses exhibiting streak disease or mosaic disease are named. Streak probably occurs throughout the coastal belt of Natal and the Eastern Province of the Cape, to an altitude as great as 3,000 ft., but rarely up to 4,500 ft.

Although Uba shows a high degree of tolerance to streak disease, no observed case showed any injury comparable to that normally caused by mosaic in plants susceptible to this disease.

One case of undoubted spread without replantation is regarded as positive evidence of secondary infection, and cases of supposed secondary infection have been held under control. Maize and annual wild grasses give what is regarded as a clear demonstration of secondary infection. The fact of transmission of streak by cane seed stock is regarded as fully established.

The evidence presented favors the conclusions that streak is an infectious chlorosis of a type similar to mosaic, and that it is not identical with mosaic.

Streak disease of sugar-cane, H. H. STOREY (*Union So. Africa Dept. Agr. Sci. Bul. 39 (1925), pp. 30, pls. 2, figs. 6*).—The author deals with the present widespread distribution of this disease in Natal, its symptoms, causes, and other grasses attacked, also the effects on Uba cane, streak disease transmission, and control measures.

Eleven varieties susceptible to streak are listed, and 19 species of grasses, cultivated or wild, appear to be susceptible. Uba cane, though measurably tolerant, loses at least 12 per cent, possibly as high as from 30 to 50 per cent, from streak disease. *The disease is invariably transmitted in stock from* diseased plants. A secondary spread occurs through the proved agency of a jassid leafhopper, *Balclutha mbila*. The secondary spread occurs with greatly varied intensity in different localities, and is supposed to be greatly favored by the close proximity of maize. The control method regarded as most hopeful is the use of new cane varieties or resistant strains of Uba. Direct control of the disease in Uba is obtained by the methods of seed selection and roguing.

Andreaea deliensis n. g. and sp., a stack fungus of Deli tobacco [trans. title], B. T. PALM and S. C. J. JOCHEMS (*Bul. Deli Proefsta. Medan, No. 19 (1923), pp. 21, pls. 3, fig. 1*).—During 1921 and 1922 some loss was caused in the tobacco-growing district along the Sumatra east coast by a fungus in the fermenting stacks forming white to grayish moldy spots on the leaves. This fungus, which appears to be allied or similar in some respects to that causing "floritura" on Italian tobacco, as noted by Splendore (E. S. R., 11, p. 515), is described in a preliminary way as a new genus and a new species and named *Andreaea deliensis*, but the name Andreaea already having been given to another plant, the generic name Andreaeana is now given it, so that the name now stands as *Andreaeana deliensis*, with the synonym *Andreaea deliensis*.

Experiments on the control of wildfire of tobacco, J. JOHNSON and H. F. MURWIN (*Wisconsin Sta. Research Bul. 62 (1925), pp. 35, pls. 7*).—The results are given of a study of the factors which are concerned in seed-bed infection by *Bacterium tabacum*, together with methods of preventing the same. The authors claim that practically every case of wildfire infection can be traced to seed-bed infection, and control is, therefore, almost entirely a matter of seed-bed treatment.

The organism causing this disease is said to overwinter on infected tobacco leaves which are cured or dried and which remain dry between growing crops. The disease is also seed borne, and for control it is considered advisable to locate plant beds a considerable distance from curing sheds or other places which may have harbored infected tobacco over winter, and to disinfect the seed with a solution of silver nitrate 1 to 1,000. Seed disinfection with corrosive sublimate can not be used, it is claimed, where seed is to be sprouted before sowing.

The wildfire bacteria are said to produce a toxin in host tissues and in cultures, which is responsible for the chlorosis produced in plant tissues. This toxin is readily separable from the bacteria by filtration and will produce typical symptoms by inoculation.

Diseases of seed fruit trees and their control [trans. title], B. Ivanov (*Spis. Zeml. Izp. Inst. B''lgariiā* (*Rev. Insts. Recherches Agron. Bulgarie*), *3* (*1924*), *No. 1, pp. 57–65*).—This brief and somewhat general account includes winter injury to trunks, sun injury to leaves, and water core in apples, also stoniness and mealiness in pears. Mistletoe (*Viscum album*) is named as a significant parasite of higher grade, while lower forms known to cause injury include *Bacterium tumefaciens* and a number of fungi.

Physiological studies on Gloeosporium, with special reference to the strains obtained from apple and cherry, T. Matsumoto (*Bul. Imp. Col. Agr. and Forestry, Japan, No. 8* (*1924*), *pp. 15–50, pl. 1*).—The chief object of the present study, largely a specialization of work previously noted (E. S. R. 50, p. 43), was to compare as to physiological behavior the two original Gloeosporium strains from apple and from cherry, also the reisolated strains. It is inferred that these are in reality distinct physiological strains of *G. fructigenum*.

Blight resistance in pears and characteristics of pear species and stocks, F. C. Reimer (*Oregon Sta. Bul. 214* (*1925*), *pp. 5–99, figs. 35*).—An account is given of the author's efforts during the past 12 years in assembling a large collection of species and varieties of pears to test their resistance to bacterial blight and their suitability as stocks on which to graft more susceptible commercial varieties. It is claimed that practically all the known wild species and most of the available varieties have been assembled and tested for blight resistance. In every species except the wild type of *Pyrus ussuriensis*, the vast majority of seedlings were found to blight readily in the young shoots when inoculated.

French seedlings and most of the cultivated varieties in America which belong to the species *P. communis* proved the most susceptible to blight. This species is said to endure shallow and wet soils remarkably well and to be resistant to mushroom root rot. It is considered an ideal stock where root blight is not prevalent. A higher degree of resistance to blight in the trunks and roots was shown by *P. calleryana* than any of the other species tested, and as the young trees of this stock are more vigorous than those of any other species, it is considered the most promising stock for southern Oregon. The wild type of *P. ussuriensis* gave a higher percentage of resistant seedlings than any other species, but on account of its exceedingly slow growth this species is considered of little value for stock. Some seedlings of cultivated varieties of *P. ussuriensis* ranked second to *P. calleryana* in resistance to root blight. As stock, it is not thought that these seedlings will prove satisfactory on shallow, very heavy, or wet soils. A small percentage of immune seedlings were obtained from *P. betulaefolia*. This species is said to endure alkaline conditions and to propagate more readily from root cuttings than any other species of Pyrus, and it is considered well adapted to gravelly and sandy soils.

Of the Japanese pear seedlings, *P. serotina*, a few proved immune in all portions of the tree, but this stock will not thrive on shallow or wet soils and is very susceptible to mushroom root rot.

The author states that in every one of the five most important species of pears some seedlings have been found that are highly resistant to blight and are extremely vigorous. He believes that if these trees can be readily propagated they will prove more valuable than the variable seedlings now available. In his inoculation experiments, the most resistant American varieties of *P. communis* were Farmingdale, Longworth, and Old Home, and these are considered promising for trunk and framework stocks. Six varieties of *P. ussuriensis*, of Chinese origin, have proved immune.

The author believes that the losses from trunk and root blight can be largely prevented in the newer orchards by planting a resistant variety like Old Home on a resistant rootstock such as *P. calleryana* or Ba Li Hsiang and top working them when three or four years old with the desired commercial variety.

Attention is called to the fact that the results obtained in Oregon may not be applied to the States east of the Rocky Mountains with their humid summer climate.

A report on gooseberry diseases in East Sussex, 1922–1923, V. H. Blackman and G. H. Jones (*Lewes, East Sussex: County of East Sussex, 1923, pp. 12*).—This report presents the results of an investigation provided for by a special research grant of the Ministry of Agriculture and Fisheries of Great Britain, made in 1922 and carried out in 1923, the initial action having been, apparently, a reaction to losses sustained by fruit growers resulting from attacks of *Armillaria mellea* and by *Botrytis* sp. in the fruit plantations. These diseases are not confined to gooseberries.

The report deals with the general situation, previous work, a disease survey, organisms present, conclusions as to the nature of the gooseberry disease, control measures, and manurial influences.

Red burn of grape [trans. title], L. Ravaz and G. Verge (*Ann. École Natl. Agr. Montpellier, n. ser., 18 [1923], No. 1, pp. 5–37, pls. 2, figs. 11*).—Grape rougeau (rougeot), or red burn, long known to vineyardists and ascribed to various causes, but particularly by Müller-Thurgau (E. S. R., 15, p. 486) to the fungus *Pseudopeziza tracheiphila*, is claimed to be due to abnormal variations in the ratio of production : consumption as regards the carbohydrates elaborated and utilized by the vine. The relations of different facts and factors to this ratio are discussed.

Ligneous zonation and die-back in the lime (Citrus medica, var. acida) in the West Indies, T. G. Mason (*Roy. Dublin Soc. Sci. Proc., n. ser., 17 (1923), No. 31, pp. 255–262, pls. 4, fig. 1*).—This paper records the results of a study of the ligneous zonation of shoots from lime trees in diverse regions of Dominica and Montserrat, half of the trees so used being affected with die-back.

The zonation in woody cylinders from healthy trees indicates a rather definite periodicity in the activity of the cambium, tangential bands of parenchyma being generally distributed within the more porous zone of vessels. As the lime tree in these islands makes its vegetative growth during the dry season, it is inferred that the zones of vessels registered the production of leaves at this period, while the water supply was adequate, and that the tangential parenchyma distributed within these zones originated at periods of relatively great aridity. Rapid fluctuations in aridity are characteristic of the climate in the dry season. Wood of shoots from trees affected with die-back showed irregularity in the distribution of the parenchyma bands. All the sections suggested that the cambium had been exposed to sudden checks in its activity.

"It was tentatively concluded that an important factor in causing the dying back of the shoots was rapid and repeated desiccation of the meristems. In the terminal meristem this resulted in a premature loss of the dominance of the apical bud, and its replacement by daughter shoots, which in turn suffered the same fate; and in the cambium by the production of tangential parenchyma."

The diseases of Coffea arabica in Uganda, W. Small (*Uganda Dept. Agr. Circ. 9 (1923), pp. 22*).—The present circular, one of the series previously noted (E. S. R., 48, p. 149), deals in brief systematic form with Uganda coffee

diseases, including, on leaves and berries, leaf disease (*Hemileia vastatrix*), leaf spot and berry blotch (*Cercospora coffeicola*), brown blight of leaves and berries (*Colletotrichum coffeanum* (*Glomerella cingulata*)), sooty mold (*Capnodium brasiliense*), and defective beans (several fungi); on stems and branches, branch anthracnose, die-back, witches'-broom, and two mistletoes (*Loranthus usuiensis* and *L. braunii*); and on roots, brown root disease (*Fomes lamaoensis*), root rot (*Armillaria mellea*), and mealy bug disease (*Pseudococcus citri* associated with *Polyporus coffeae*).

Studies on the deformations, diseases, and enemies of the coffee tree in Venezuela [1877] [trans. title], A. Ernst (*Bol. Cám. Com. Caracas, No. 120* (*1923*), *pp. 31*).—This bulletin presents, with annotations principally by H. Pittier and with a prefatory explanation, what is said to have been a prize contribution in a literary and scientific competition held in Caracas in 1877. It presents, in a systematic manner, known factors and conditions tending to affect unfavorably coffee production in Venezuela at that time.

Diseases, or prejudicial disorders, of coffee are ascribed to unfavorable conditions of soil or atmosphere, to external injuries, to animals, and to plant parasites, mention being made of several mistletoes and fungi.

The occurrence of teleutospores in Hemileia vastatrix B. & Br., C. Ragunathan (*Ceylon Dept. Agr. Yearbook, 1923, p. 62*).—A very condensed summary is given of work carried out from May, 1921, to April, 1922, regarding the occurrence of teleutospores in *H. vastatrix* on *Coffea arabica*, *C. robusta*, and *C. liberica*. Teleutospores were found every month except August and October, 1921, and April, 1922, their occurrence depending, apparently, on climatic conditions.

Black rot of tea, T. Petch (*Ceylon Dept. Agr. Yearbook, 1923, pp. 23, 24*).—The fungus previously noted as associated with tea black rot (E. S. R., 38, p. 354) was there referred to as *Hypochnus* sp., but it is now claimed that in accordance with modern practice this fungus should be known as Corticium, though probably not as *C. theae*. Investigations referred to indicate that there are at least two species of Corticium causing tea black rot in Ceylon.

Cercosporella leaf disease, T. Petch (*Ceylon Dept. Agr. Yearbook, 1923, pp. 21–23, pl. 1*).—Cercosporella leaf disease (*C. theae*), first observed in 1909 defoliating young nursery tea plants, has since become generally distributed in up-country districts, more particularly in districts subject to the rains of both monsoon areas. This fungus also attacks *Acacia decurrens*, *A. melanoxylon*, and *A. dealbata*, as well as species of Eucalyptus.

Grey blight of tea and coconut: A comparative study, L. S. Bertus (*Ceylon Dept. Agr. Yearbook, 1923, pp. 43–46, pls. 3*).—A study of the gray blights of tea and of coconut to identify the fungus causing each disease is said to leave no doubt that the Ceylon species on coconut is *Pestalozzia palmarum* and that on tea is *P. theae*.

Disease of betel-vine in Bengal, C. M. Hutchinson (*Agr. Research Inst., Pusa, Sci. Rpts., 1923–24, pp. 37–39*).—This section of the report of the imperial agricultural bacteriologist deals with a widespread disease of betel-vine plantations, reported from Bengal. Diseased plants show numerous bacteria in the water vessels of the stem. A study of the causal organism is reported as in progress. Soil conditions are somewhat similar to those favoring *Bacterium solanacearum*.

Anthracnose of the Boston fern, J. A. Faris (*Mycologia, 15* (*1923*), *No. 2, pp. 89–95, pls. 2*).—Boston ferns (*Nephrolepis exaltata*) in the Brooklyn Botanic Garden were first observed in 1919 to be attacked by anthracnose, which has

been studied and is here described, as is also the causal organism as to its morphology and physiology. The imperfect stage is said to be of the typical Colletotrichum type. Experimentation results and growth characters are thought to justify the author in giving it rank as a new species, and it is, therefore, tentatively named *Glomerella nephrolepis.*

Anther smut of Salvia, Ustilago betonicae [trans. title], O. KIRCHNER (*Ztschr. Pflanzenkrank., 33 (1923), No. 3–4, pp. 97–104, figs. 3*).—Studies are briefly detailed as applied to different phases of *S. pratensis* anther smut, due to *U. betonicae.*

A root disease of Hevea (Xylaria thwaitesii Cooke), T. PETCH (*Ceylon Dept. Agr. Yearbook, 1923, pp. 34, 35, pl. 1*).—A root disease of Hevea, supposedly caused by a Xylaria, was observed in 1910, but not later until 1921, when it was again observed, and a third time in 1922, the trees attacked in all cases being over 12 years of age. The appearance and progress of the disease are described. The fungus, at first referred to as *X. zeylanica*, is now thought to be *X. thwaitesii.*

The mode of distribution of chestnut black canker and control measures [trans. title], L. PETRI (*Nuovi Ann. [Italy] Min. Agr., 3 (1923), No. 1, pp. 3–19, figs. 4*).—Chestnut black canker, previously investigated by the author (E. S. R., 39, p. 554; 43, p. 448), is said to have been found in 137 communes of Italy, though very unevenly distributed. Probable means of dispersal are discussed, as are also the organisms present, the regions affected, and the movement of the infection within the chestnut trees individually.

Oak Oidium in Bulgaria [trans. title], KHR. SAVOV (*Spis. Zeml. Izp. Inst. B''lgariiā (Rev. Insts. Recherches Agron. Bulgarie), 3 (1924), No. 1, pp. 26–30, figs. 6*).—Oak Oidium (*Microsphaera alphitoides*) is said to have been first known in Bulgaria in 1910, the author having first seen the perithecial form on oak leaves in 1919. Descriptions of different phases are given.

White pine is profitable if protected from blister rust, J. F. MARTIN (*U. S. Dept. Agr., Misc. Circ. 40 (1925), folder, figs. 8*).—The white pine blister rust is described, and as a means of control eradication of currant and gooseberry plants, which serve as alternate hosts for the fungus, is advised.

Decay of lumber and building timbers due to Poria incrassata (B. & C.) Burt, C. J. HUMPHREY (*Mycologia, 15 (1923), No. 6, pp. 258–277, pls. 3*).—An account of related studies during 12 years has been noted (E. S. R., 51, p. 53). Complete eradication of wood infected with *P. incrassata* is the only feasible remedy. Adjacent timbers should be thoroughly sprayed. No light preservative will give full protection, and infection already in the wood can not be destroyed by such treatments.

Occurrence and identity of cotton mill fungi, W. H. SNELL (*Mycologia, 15 (1923), No. 4, pp. 153–165, pl. 1*).—To the information previously noted (E. S. R., 47, p. 451), the author now adds further observations on the occurrence of Myxomycetes and fungi within cotton mill structures and studies on the identity of those which appear to be primary agents in the decay of mill timbers, with additional notes on the cultural characters of certain of these organisms, including *Fuligo ovata, Stemonitis fusca, Reticularia lycoperdon, Peniophora pubera, P. gigantea, Coniophora cerebella,* and *Merulius lacrymans.*

Lenzites sepiaria and *L. trabea* are compared. Cases of decay by *Trametes serialis* are reported, and similarities are noted between characters of *Fomes officinalis* and those of *T. serialis.* Observations are reported regarding the occurrence and cultural characters of *T. carnea.* Evidence is adduced to show that the Lentinus found in decaying weave shed roofs is *L. lepideus* and not *L. tigrinus,* studies on which fungus during five years are reported.

ECONOMIC ZOOLOGY—ENTOMOLOGY

Blue-fox farming in Alaska, F. G. ASHBROOK and E. P. WALKER (*U. S. Dept. Agr. Bul. 1350 (1925), pp. 35, figs. 28*).—Following an introduction, the authors deal with the selection of an island or ranch site, ranch organization, the essentials of breeding, the essentials of feeding, transportation, pelting, the characteristics of a good pelt, losses from depredations, sanitation and the treatment of disease, failures and abandonments, breeders' associations and ranches, and white-fox farming in northern Alaska.

The muskrat in New York: Its natural history and economics, C. E. JOHNSON (*Roosevelt Wild Life Bul.* [*Syracuse Univ.*], *3 (1925), No. 2, pp. 205–320, pls. 3, figs. 40*).—The life history and habits of the muskrat are first considered at length (pp. 205–303). This is followed by a discussion of its economic status. A list of references (pp. 314–320) is included.

A disease in wild rats with gross pathology resembling plague, N. E. WAYSON (*Pub. Health Rpts.* [*U. S.*], *40 (1925), No. 38, pp. 1975–1979*).—This is an account of a disease observed among wild rats in Oakland, Calif., and the neighboring cities, the gross pathology of which resembles plague in rats. The causative agent is apparently one of the hemorrhagic septicemia group. It produces acute death in inoculated guinea pigs, wild rats, and white rats, with resultant lesions resembling somewhat very acute plague deaths in these animals.

Directory of officials and organizations concerned with the protection of birds and game, 1925, compiled by T. DENMEAD and F. L. EARNSHAW (*U. S. Dept. Agr., Dept. Circ. 360 (1925), pp. 12*).—This is the twenty-sixth annual directory of officials and organizations concerned with the protection of birds and game (E. S. R., 52, p. 452).

Field book of birds of the southwestern United States, L. E. WYMAN and E. F. BURNELL (*Boston: Houghton Mifflin Co., 1925, pp. XXV+308, pls. 4, figs. 347*).—The main part of this guide to the birds of the southwestern United States gives brief descriptions in connection with pen drawings of the various forms and maps showing their distribution. Life zones are considered in connection with maps in colors. Field color keys to the species of the orders and families considered, a list of the birds treated, and a reference list of books are included.

Food habits of the vireos, a family of insectivorous birds, E. A. CHAPIN (*U. S. Dept. Agr. Bul. 1355 (1925), pp. 44, figs. 9*).—This bulletin reports in tabular form the percentages of various items in the food of 18 forms of vireos. In no case did stomachs of any of the vireos contain a large proportion of cultivated fruit, and very few stomachs had any; so that, as fruit eaters the vireos are practically harmless. In all species almost the entire bulk of the animal food was made up of insects, most of which were either neutral or definitely injurious in their economic relations and may be placed on the credit side of the account of these birds.

The literature of the Charadriiformes from 1894–1924, G. C. LOW (*London: H. F. & G. Witherby, 1924, pp. XI+220*).—In addition to the literature, this work includes a classification of the order and lists of the genera, species, and subspecies.

Concerning the habits of insects, F. BALFOUR-BROWNE (*Cambridge, Eng.: Univ. Press, 1925, pp. X+169, pls. 9, figs. 6*).—This is a popular account.

[Report of work in] field entomology, T. D. URBAHNS (*Calif. Dept. Agr. Mo. Bul., 13 (1924), No. 7–12, pp. 161–164*).—This is a brief discussion of the more important insect problems and work performed by the entomologist during the year.

[Report of the entomological work of the Florida Station, 1919], J. R. Watson and E. Osborn (*Florida Sta. Rpt. 1919, pp. 50–65*).—The Report of the Entomologist, by J. R. Watson (pp. 50–59) deals with the work of the year in entomology under the headings of control of root-knot nematodes (see page 247); the velvet bean caterpillar (*Anticarsia gemmatilis*); other insect pests of velvet beans; thrips on citrus, including Mason's thrips (*Frankliniella cephalica masoni* Wats.) and the Cuban citrus thrips (*F. insularis* Frank.); thrips on peanuts (*F. bispinosa* Morg.); the camphor thrips; plant bugs, including the pumpkin bug (*Nezara viridula*) and the cotton stainer on citrus; the California whitefly-eating *Delphastus catalinae*; some insects of the year; and castor bean insects.

The Report of the Assistant Entomologist, by E. Osborn (pp. 60–65), which follows, deals with the leaf-footed bug and the big-legged plant bug (*Acanthocephala femorata* Fab.).

Insect pests (*Tennessee Sta. Rpt. 1924, pp. 27–31, figs. 9*).—This is a brief statement of the entomological work of the year, in which particular mention is made of the insecticide work previously reported upon by Marcovitch (E. S. R., 52, p. 555). Attention is also called to the fact that the woolly apple aphid is one of the worst pests of the apple in Tennessee, and to the urgent need of a good remedy.

List of parasitic insects reared from host insects collected in the vicinity of Brownsville, Texas, R. A. Vickery (*Ent. Soc. Wash. Proc., 27 (1925), No. 7, pp. 137–141*).—This presents the records of rearings of parasites, many of which are of considerable economic importance.

Prairie problems in entomology, E. H. Strickland (*Sci. Agr., 6 (1925), No. 2, pp. 37–40*).—This is a brief discussion of some of the problems arising in the prairie provinces of Canada.

Insect pests of 1924, R. S. MacDougall (*Highland and Agr. Soc. Scot. Trans., 5. ser., 37 (1925), pp. 167–193, figs. 21*).—This is a summary of information on the more important insect enemies of the year in Scotland.

The insect and related pests of Egypt, II, F. C. Willcocks (*Cairo: Sultanic Agr. Soc., 1925, pp. VIII+418, pls. 20, figs. 94*).—This second volume of the work previously noted (E. S. R., 40, p. 856) deals with insects and mites feeding on wheat and barley (pp. 1–129), on maize (pp. 133–152), on millets (pp. 155–202), on sugar cane (pp. 205–327,) and on rice (pp. 331–353), and with insects of the granary and mill (pp. 357–412). The life history and work of these pests and of some of their natural enemies are illustrated in colored plates.

List of publications on Indian entomology, 1923, compiled by [T. B. Fletcher] (*Agr. Research Inst., Pusa, Bul. 155 (1924), pp. 59*).—This list includes information on the contents of a large proportion of the papers listed.

Report on the Second Imperial Entomological Conference, June, 1925 (*London: Govt., 1925, pp. 35*).—This is the report of a second entomological conference (E. S. R., 45, p. 454), held in London from June 9 to 18, 1925.

Common alfalfa insects, W. Carter and A. G. Ruggles (*Minn. Univ. Agr. Ext. Spec. Bul. 99 (1925), pp. 8, figs. 6*).—A brief practical account.

Cane pest combat and control, E. Jarvis (*Queensland Agr. Jour., 24 (1925), No. 3, pp. 219–223*).—Notes are presented on poison baits for cane grubs, parasites of cane skippers, benzene as a grub fumigant, crickets attacking sugar cane, relative merits of paradichlorobenzene and carbon disulfide, control of *Rhabdocnemis obscurus*, and a promising grub fumigant.

[Insect enemies of] melons and other cucurbits, W. M. Perry (*Virgin Islands Sta. Rpt. 1924, p. 11*).—It is pointed out that the melon worm, melon

aphid, and the plant bug *Phthia picta* persistently attack melons and other cucurbits in the Virgin Islands, frequently making the weekly application of insecticides necessary. The melon worm was controlled with a combination of lead arsenate and Bordeaux mixture, 4-4-50 formula. The melon aphid was held in check with kerosene emulsion, the stock solution of which was diluted 1 part to 12 parts of water before using. The plant bug was checked by the use of a poison bait, consisting of a ripe tomato into which corrosive sublimate had been injected, placed on each melon hill.

Insects on African oil-palms, B. A. R. Gater (*Malayan Agr. Jour., 13 (1925), No. 8, pp. 250-256*).—A brief discussion of the status of oil-palm insects in Africa.

Insects and disease of man, C. Fox (*Philadelphia: P. Blakiston's Son & Co., (1925), pp. XII+349, figs. 92*).—The author has here attempted to gather together in a concise and practical way the information necessary for a student taking up the study of medical entomology, or for the health officer working in the field of preventable diseases transmitted by arthropods. The first part (pp. 1-227), which is devoted to medical entomology, deals with the insects related to disease transmission. Part 2 (pp. 229-328) is devoted to the diseases carried by arthropods among human beings, a chapter being devoted to each of the more important affections.

Deposits of arsenic and copper on eating apples (*Jour. Min. Agr. [Gt. Brit.], 32 (1925), No. 6, pp. 549-553*).—Analyses made for the presence of lead, copper, and arsenic on apples bought in the market are reported in tabular form.

Of 24 samples of apples from English, Canadian, and American orchards, 11 were free from arsenic, 9 contained traces, and 4 contained an appreciable amount. Of the 4, 1 contained 1/55 grain of arsenious oxide per pound of apples, the other 3 containing much less. It is pointed out that, since the medicinal dose of arsenic is from 1/64 to 1/16 grain, at least ½ lb. of the apples, including stalk and calyx, must be consumed to get a minimum dose and 2½ lbs. to get a maximum dose. It was shown that one-half the total arsenic was localized around the stalk and calyx.

The amount of lead and copper present was too small to be of importance.

Fish poisons as insecticides, F. Tattersfield (*Nature [London], 116 (1925), No. 2911, p. 243*).—The author reports that extracts prepared from black and white haiari with water and organic solvents have been recently tested in the laboratory of the Rothamsted Experimental Station as contact insecticides, and that both, but particularly those prepared by the use of organic solvents, have been found to be highly poisonous to aphids. These two plants were secured from British Guiana, where they have been employed by the aborigines as fish poisons. It is thought that both may prove to be of economic importance as insecticides.

Investigations of spring-tails attacking mangolds, W. M. Davies (*Jour. Min. Agr. [Gt. Brit.], 32 (1925), No. 4, pp. 350-354, pl. 1*).—These notes relate to six species of springtails which appeared in abundance and caused considerable injury to mangels in North Wales, Shropshire, Lancashire, and other areas during 1922-1924.

An account of the migratory grasshoppers of Senegal and means for their control, E. L. Saunion (*Notice sur les Acridiens Migrateurs au Sénégal pour Servir à Leur Étude, et des Moyens Propres à les Combattre. Bordeaux: Inst. Colon., 1924, pp. 34*).—Of the grasshoppers which occur in the colony of Senegal, *Acridium peregrinum* and *Stauronotus maroccanus* are the most important.

A revision of the insects of the aphid genus Amphorophora, P. W. MASON (*U. S. Natl. Mus. Proc. 67 (1925), Art. 20, pp. 92, pls. 18*).—Thirty-nine species of this genus are recognized, of which 16 are described as new.

The obscure scale attacking pecan trees, H. L. DOZIER (*Fla. State Plant Bd. Quart. Bul., 9 (1925), No. 4, pp. 129–133*).—The obscure scale has of recent years become a serious pest of oak shade trees in the Gulf Coast States, the author having observed many willow oaks in New Orleans entirely incrusted with the scale, and in numerous instances the trees being killed. It is reported as a serious pest of both the native wild and the cultivated paper-shell varieties of pecans in Texas, and the author has found it scattered over the pecan belt in the Gulf coast section of south Alabama, though it has not yet been observed on pecans in Florida. It has been recorded from the States of Ohio, Illinois, Kansas, Indiana, Arkansas, Texas, Louisiana, Mississippi, Georgia, and Florida, and the District of Columbia.

The value of sprays and fumigation for resistant black scale control, R. S. WOGLUM (*Los Angeles: Calif. Fruit Growers Exch., Bur. Pest Control, 1925, pp. [20], figs. 2*).—This is an analysis based on conditions in eastern Los Angeles and western San Bernardino Counties, Calif.

[Purple scale on citrus], W. M. PERRY (*Virgin Islands Sta. Rpt. 1924, p. 13*).—The infestation of citrus by purple scale was effectively combated with lubricating oil emulsion.

Lac in Burma, F. W. WITHERS and E. C. SIMMONS (*Burma Forest Bul. 12 (1925), pp. [3]+41*).—This is a report on a tour in the Central Provinces, extending from November, 1924, to February, 1925, for the purpose of studying the departmental cultivation of lac. Some suggestions for the improvement of lac cultivation in Burma are included.

The larger cabbage moth (Crocidolomia binotalis Zell.), D. GUNN (*Union So. Africa Dept. Agr. Jour., 11 (1925), No. 3, pp. 233–239, figs. 6*).—A summary of information on this pest, which is distributed throughout the Union of South Africa, being principally an enemy of cruciferous plants.

Note on Anarsia lineatella Zell. and its parasites in the vicinity of Lyon in 1924 [trans. title], J. C. FAURE and L. ALABOUVETTE (*Rev. Zool. Agr. et Appl., 23 (1924), No. 12, pp. 279–288, figs. 4*).—Notes are first presented on the life history and habits of the peach twig borer in France, where it is commonly met with on the peach, but ordinarily causes little injury. However, in the last few years it has caused serious injury in the vicinity of Fréjus and Puget-sur-Argens. An account is next given of the hymenopterous parasites observed, including *Paralitomastix* (*Encyrtus*) *variicornis* Nees., *Apanteles emarginatus* Nees., *A. xanthostigmus anarsiae* n. var., *Phygadeuon rusticatus* Wsm., and *Hemiteles incisus* Bridg. In the vicinity of St.-Genis-Laval in 1924 about 70 per cent of the larvae of the first generation were killed by the parasites. *P. variicornis* destroyed 37 per cent, *A. xanthostigmus anarsiae* 17 per cent, and *P. rusticatus* 11 per cent.

The cotton pyralids Sylepta derogata F. and Glyphodes indica Saund. in French West Africa [trans. title], P. VAYSSIÈRE and J. MIMEUR (*Agron. Colon., 12 (1925), No. 90, pp. 255–268, figs. 4*).—This is an account of two pyralids the larvae of which are important enemies of cotton foliage. Several parasites of *S. derogata* are considered in an appendix, by C. Ferrière (pp. 260–266), of which three are described as new, namely, *Apanteles syleptae*, *Stictopisthus africanus*, and *Eupelmus soudanensis*.

Diptera of medical and veterinary importance, I, II, W. S. PATTON (*Philippine Jour. Sci., 27 (1925), Nos. 2, pp. 177–200; 3, pp. 397–411*).—The first part

of this work deals with types of Diptera of older authors in continental museums, and the second part with the more important blowflies, Calliphorinae.

Relation between temperature, humidity, and activity of house mosquitoes, W. Rudolfs (*Jour. N. Y. Ent. Soc., 33 (1925), No. 3, pp. 163–169, fig. 1*).—In this contribution from the New Jersey Experiment Stations, 15-minute catches of house mosquitoes are compared with the temperature and percentage of relative humidity existing at the time of collecting. The results indicate that a close relation exists between the numbers of mosquitoes caught, which is supposed to indicate the activity of the insects, and the temperature, and also between the numbers caught and the relative humidity. The results of experiments and the behavior of confined mosquitoes at different temperatures seem to accord with the field observations.

Mosquito repellents, C. W. O. Bunker and A. D. Hirschfelder (*Amer. Jour. Trop. Med., 5 (1925), No. 5, pp. 359–383*).—This is a report of an extended investigation of the repellent action of numerous chemicals, the details of which are reported in tabular form. The rank suggested for those that have had enough tests to justify comparison is as follows: Citronellol, caprylic alcohol, benzyl alcohol, geranyl acetate, linalyl acetate, amyl salicylate, acetophenone, oleum picis liquidae rectificatum, phenyl-propyl alcohol, olive oil, citronellal, camphor, vanillin, methyl cinnamate, menthol, cedarwood oil, citral, coumarin, β-naphthol-ethyl ether, and geraniol.

The mosquito-theory of malaria and the late Prof. G. B. Grassi, R. Ross (*Sci. Prog. [London], 20 (1925), No. 78, pp. 311–320*).—This is a review of the advance of knowledge of the relation of anopheline mosquitoes to the transmission of malaria.

Origin and life cycle of grubs in cattle hides, J. L. Webb (*Jour. Amer. Leather Chem. Assoc., 20 (1925), No. 10, pp. 453–456, pls. 2*).—In the course of this discussion, the author reports upon a compilation of the results of a questionnaire sent to cattlemen, packers, butchers, and tanners, which showed that 19 per cent of all the hides in the country are grubby, and during the warble season at least 50 per cent. The annual reduction in the value of hides and leather due to warbles is estimated at from five to ten million dollars.

The poisoning of fruit flies: The killing efficiency of certain arsenicals, T. McCarthy (*Agr. Gaz. N. S. Wales, 36 (1925), No. 9, pp. 667–669*).—This is a report of laboratory tests made upon the Mediterranean fruit fly. The arsenicals tested include white arsenic (arsenious oxide), sodium arsenite, potassium arsenate, calcium arsenate, and lead arsenate, which were fed to the flies in a mixture of molasses and water. Calcium arsenate was found to be the most satisfactory, even when used at half the strength of the lead arsenate, although more than one feed seems to be necessary to kill the flies.

Fruit-fly: Description and control, L. J. Newman (*West. Aust. Dept. Agr. Bul. 122 (1924), pp. 44, figs. 43*).—This account of the life history and bionomics of the Mediterranean fruit fly, means of control, etc., is a revision of a bulletin published in 1916.[3] An account of trapping methods has been noted (E. S. R., 52, p. 757).

The destruction of rat-fleas by heat on board ship, R. K. Shaw (*Jour. Roy. Naval Med. Serv., 11 (1925), No. 4, pp. 255–260*).—The experiments here reported led the author to conclude that all rat fleas can be destroyed in a dry blanket (not more than twice folded) if exposed to a temperature of 110° F. for a period of three hours. The fleas, however, are able to withstand a high temperature for a prolonged period if kept moist, and this resistance is not due entirely to the action of moisture in delaying the penetration of the heat. If blankets and clothing are quite dry and so arranged as to give free access of

[3] West. Aust. Dept. Agr. Bul. 48.

air at a minimum temperature of 110° to every portion of the articles, rat fleas on such articles will be killed within a period of three hours.

Sprays for the Japanese beetle, E. R. Van Leeuwen (*Penn. Dept. Agr. Bul. 406 (1925), pp. 8, figs. 6*).—A brief practical account.

The May beetles in Germany [trans. title], M. Schmidt (*Arb. Biol. Reichsanst. Land. u. Forstw., 14 (1925), No. 1, pp. 1–76, pl. 1*).—A report is given of the yearly occurrence of *Melolontha melolontha* L. and *M. hippocastani* F. in the provinces of Germany, the length of their life cycles, etc.

Beekeeping, L. T. Floyd and A. V. Mitchener (*Manitoba Dept. Agr. and Immigr. Ext. Bul. 78 (1925), pp. 31, figs. 11*).—This is a practical account.

Practical apiculture: The inhabitants of the hive, P. Lemaire (*Apiculture Pratique. Les Habitants de la Ruche. Paris: J.-B. Baillière & Sons, 1925, pp. 126, figs. 25*).—This is a small handbook dealing with the life of the honeybee.

Argentine ant campaigns successful (*Miss. State Plant Bd. Quart. Bul., 5 (1925), No. 2, pp. 7–9*).—Campaigns against the Argentine ant in 19 towns in Mississippi in the fall of 1923 and of 1924 are said to have been the most uniformly successful of any attempted. The results are presented in tabular form.

A guide to apiculture, M. Arnould (*Abeilles Productives: Ruchers Modernes. Paris: Libr. Agr. Maison Rustique, [1925], pp. 262, figs. 93*).—This is a small handbook on beekeeping, inclnding the improved methods.

Profitable honey plants of Australasia, T. Rayment (*Melbourne and London: Whitcombe & Tombs, [1925], pp. [5]+132, pl. 1, figs. 46*).—In addition to an annotated list of honey plants, which takes up the greater part of the work (pp. 36–116), information is given on honey flows and their sources (pp. 1–6), flowers and bees mutually dependent (pp. 6–16), and pollen (pp. 16–36). Censuses of the genera Acacia (pp. 117–126) and Eucalyptus (pp. 126–132) are appended.

A contribution to the biology of Dibrachys boucheanus Ratz. [trans. title], J. C. Faure and B. Zolstarewsky (*Rev. Path. Vég. et Ent. Agr., 12 (1925), No. 2, pp. 144–161*).—This is a report of studies of a widespread polyphagous pteromalid, which is an external parasite, particularly of other Hymenoptera. The closely related *D. affinis*, which may have been mistaken for it, is an internal parasite. A bibliography of 37 titles is included.

Introduction of a parasite of the woolly aphis, R. Stenton (*Jour. Min. Agr. [Gt. Brit.], 32 (1925), No. 4, pp. 343–349*).—The author reports upon the introduction of the chalcid parasite *Aphelinus mali* from France in March, 1923, and its increase in England.

An aphidious parasite of the peach aphid [trans. title], C. Gautier and S. Bonnamour (*Bul. Soc. Ent. France, No. 7 (1925), p. 127*).—The authors record the rearing of a species of Aphidius resembling *A. carduі* Marsh. from the peach aphid, which appeared in great numbers during July and August, 1923, at Monplaisir, a suburb of Lyon, and at St.-Genis-Laval, France. The parasitism of the aphid is said to have been nearly total during these months. What appeared to be the same species was discovered at Châtillon d'Azergues (Rhône) in August, 1924

Rocky Mountain spotted fever: Vaccination of monkeys and man, R. R. Spencer and R. R. Parker (*Pub. Health Rpts. [U. S.], 40 (1925), No. 41, pp. 2159–2167, pls. 2, figs. 2*).—The authors describe the technique for the preparation of a protective vaccine against Rocky Mountain spotted fever from infected adult ticks. The potency, keeping qualities, and duration of immunity induced by this vaccine have been estimated within certain limits. The

vaccine will protect guinea pigs, rabbits, and monkeys, and it has been administered to 34 men with no severe reactions. The course and outcome of a case of Rocky Mountain spotted fever developing eight days after the first dose of vaccine suggests that the infection was modified.

Primary tularemia of the eye, M. C. PFUNDER (*Jour. Amer. Med. Assoc., 85 (1925), No. 14, p. 1061, fig. 1*).—This is a report of a case of primary infection of the eye due to *Bacterium tularense*, in Montana. The infection appears to have taken place while removing Rocky Mountain spotted fever ticks from team horses. Reference is made to an epidemic among rabbits in Montana, thought to be tularemia, that appears once in about seven years and kills thousands.

A pest in the mango nursery, G. F. MOZNETTE (*Fla. State Plant Bd. Quart. Bul., 9 (1925), No. 3, pp. 121, 122*).—This is a brief account of *Tarsonemus latus* Banks and its damage to the leaves of the mango in the nursery at Miami, Fla.

The destruction of Ascaris eggs, S. OGATA (*Ann. Trop. Med. and Parasitol., 19 (1925), No. 3, pp. 301–304*).—The author finds that the vitality of Ascaris eggs is destroyed by immersion in water above 70° C. for 1 second, at 65° for 2 seconds, at 60° for 5 seconds, at 55° for 50 seconds, and at 50° for 45 minutes.

ANIMAL PRODUCTION

The animal as a converter of matter and energy, H. P. ARMSBY and C. R. MOULTON (*New York: Chem. Catalog Co., 1925, pp. 236, figs. 6*).—The first part of this monograph of the American Chemical Society deals with the chemical processes of the conversion of raw materials into animal products by means of digestion and absorption, and discusses the field of metabolism. The second part deals with the quantitative yield of food and the efficiency of conversion of food, taking up in order the methods of investigating this subject, the measurements of nutritive values, composition of the increase in animal tissue, maintainance, net efficiency, and gross efficiency. A very extensive discussion of the composition of animals is included in the work.

The effect of vitamin B deficiency on reproduction, A. S. PARKES and J. C. DRUMMOND (*Roy. Soc. [London] Proc., Ser. B, 98 (1925), No. B 688, pp. 147–171, pls. 2, figs. 2*).—Male rats receiving a basal ration of 20 parts of purified casein, 55 parts of rice starch, 15 parts of butterfat, 5 parts of minerals, and 5 parts of lemon juice, with and without the addition of 0.5, 1, 2, 3, 4, and 5 per cent of marmite, were tested as to their fertility when mated with females on normal rations at the University College, London. The numbers of young produced, as well as their sex ratios and birth weights, were also determined.

Histological examinations were made of the testicles of individuals which had been for varying periods on the different rations. The post-mortem examinations showed a remarkable stagnation of the venous circulation in animals which had been receiving rations severely deficient in vitamin B. The stagnation was especially pronounced in the spermatic vessels, the tunica of the testes was distended with serum, and the testes were shrunken. The tubules showed varying amounts of degeneration, depending on the length of the feeding and the amount of vitamin B in the ration.

The maximum time on the different rations during which males were able to fertilize females was 1 month on the basal ration only, 5 weeks with supplements of 0.5 per cent of marmite, over 23 weeks with 1 per cent of marmite, and for longer periods with more of the vitamin B. The percentage of matings resulting in pregnancies followed the amount of vitamin B in the ration, but no such relation was evident in litter size, the largest average litter size,

10.5, being sired by males receiving the basal ration only. The average of all other litters was approximately 7. There was no significant relation between litter size and length of time that the male was on the deficient ration, though the averages were 7 during 1 to 4 weeks and 8.0, 8.0, and 8.3, respectively, during the successive 4-weeks periods from 9 to 20 weeks.

A study of the sex ratios according to the diet, time on the diet, etc., tended to indicate that the proportion of males was reduced when the sire received a ration deficient in vitamin B, especially when the litters sired during the first month's feeding were eliminated. It is suggested that the vitamin B deficiency may in some way lessen the chances for fertilization by male-determining sperms. No abnormalities in the birth weights of the young were evident, though it is pointed out that normal growth was not made by those sired by males receiving deficient rations.

Some experiments on the stimulating value of vitamin preparations on growth [trans. title], J. KŘÍŽENECKÝ and J. PODHRADSKÝ (*Ztschr. Tierzüchtung u. Züchtungsbiol., 3 (1925), No. 2, pp. 189–207, figs. 7*).—The additions of commercial preparations of vitamins called Bioklein, Zooklein I, Zooklein II, and Zoosan to the rations of mice, cats, and fowls were found to exert some stimulating effect on growth when the weights were compared with the weights of control animals. A possible practical application of these results to the promotion of growth in livestock is pointed out.

Studies on the biological action of light, D. T. HARRIS (*Roy. Soc. [London] Proc., Ser. B, 98 (1925), No. B 688, pp. 171–187, pl. 1, figs. 10*).—The results of the following experiments, conducted at the University College, London, are briefly reported:

I. *The effect of light on the metabolic rate of small animals* (pp. 171–178).—The results of experiments with rats have shown that ultra-violet radiations exert a stimulating effect on the carbon dioxide production per unit of body surface. This stimulating action is completely annulled by visible radiations due to a physiological antagonism. The results of the experiments on gaseous metabolism were corroborated in further experiments in which determinations were made of the effects of ultra-violet light and visible light on the movement of the muscles of isolated frog stomachs.

II. *The part played by pigment in the skin of animals* (pp. 178–187).—A greater depression of heat production was found to occur in pigmented than in albino rats when exposed to a powerful source of light. Absorption of the radiated energy caused a distinct rise in the temperature of the dermis in pigmented animals. It is concluded that the pigment tends to afford a protection against the lethal action of certain photodynamic substances.

Some digestibility trials on Indian feeding stuffs, P. E. LANDER and P. L. C. DHARMANI (*India Dept. Agr. Mem., Chem. Ser., 7 (1924), No. 4, pp. 77–100, pl. 1, figs. 2*).—This work reports the analyses and digestibility, as determined with two bullocks, of wheat bhusa, gram, maize, and fresh shisham leaves.

Oil cakes, L. BUSSARD and C. BRIOUX (*Tourteaux. Paris: Ch. Béranger, 1925, pp. XX+350, pls. 32, figs. 55*).—The first part of this book deals with the general characteristics of oil cakes, with reference to their chemical and microscopical analyses and nutritive value. The second portion deals specifically with oil cakes made from different plant products, discussing their composition, limitations in their feeding value, and nutritive properties.

The composition and nutritive value of pumpkin seed cake [trans. title], A. ZAITSCHEK and E. JALOWETZ (*Kísérlet. Közlem., 27 (1924), No. 1–2, pp. 26–31*).—The composition and digestibility of samples of pumpkin-seed cake of poor and good quality are tabulated, as determined in feeding experiments

with wethers. The nutritive value of pumpkin-seed cake having only a small amount of oil extracted is also discussed. Much variability was found in the feeding value of the different pumpkin-seed cakes examined. The low-grade cake contained 41 per cent of crude fiber, of which only 8 per cent was digestible. The calculated starch value of this cake was 25.8 per cent. The better quality cake contained only 21 per cent of fiber, but none was digestible. Its starch value was 45.3 per cent. A large number of samples containing considerable oil consisted of from 40 to 50 per cent of protein and from 11 to 30 per cent of fat, and had a starch value of approximately 90 per cent.

Manufacture of copra in the Philippines, P. J. Wester (*Philippine Agr. Rev., 17 (1924), No. 2, pp. 101–108, pls. 6, figs. 1*).—This article describes the different methods of preparation and drying of coconut meats for the manufacture of copra meal in the Philippines.

Sugar beet pulp and slices, R. N. Dowling (*Jour. Min. Agr. [Gt. Brit.], 31 (1924), No. 8, pp. 750–757*).—The process of manufacturing wet and dried beet pulp is described and the feeding value of these products discussed.

The manufacture of commercial feeding stuffs, J. L. Hills (*Vermont Sta. Bul. 246 (1925), pp. 3–46, figs. 16*).—The author has described the preparation and manufacture of by-products and commercial mixed feeds, based on a personal study of the processes in manufacturing plants in Michigan, New York, Illinois, Indiana, and Vermont.

Inspection of commercial feeding-stuffs, T. G. Phillips and T. O. Smith (*New Hampshire Sta. Bul. 218 (1925), pp. 60*).—The usual report of the guaranties and analyses of feeding stuffs officially inspected between December, 1924, and June, 1925 (E. S. R., 52, p. 567).

[Reports of analyses of samples of feeding stuffs collected in New York State from January 1 to December 31, 1924, inclusive] (*N. Y. State Dept. Farms and Markets, Agr. Buls. 175 (1925), pp. 193; 179 (1925), pp. 141*).—These are the usual reports of the guaranteed and found analyses of feeding stuffs inspected in New York State, the first from January 1 to June 30, and the second from July 1 to December 31, 1924 (E. S. R., 52, p. 766).

Annual report of chemical laboratory for fertilizers and animal feeds [trans. title], R. Vilá Mayo (*Puerto Rico Dept. Agr. y Trab., Informe An. Lab. Quim. Abonos [etc.], Rio Piedras, 1923–24, pp. 39, fig. 1*).—The annual report of the official inspections of feeds and fertilizers for the year ended June 30, 1924.

[Report of the] National Live Stock and Meat Board [1924–25], R. E Pollock (*Natl. Livestock and Meat Bd. Rpt., 2 (1925), pp. 66, figs. 51*).—A report for the fiscal year ended June 30, 1925, reviewing the educational and research activities of the National Live Stock and Meat Board, the latter phase including a survey and study of the methods and practices of retailing meat in cooperation with the Bureau of Agricultural Economics, U. S. D. A., the value of meat for blood regeneration with the University of Rochester, the value of meat for rearing the young with Columbia University, and the iron content of meat with the Pennsylvania Experiment Station, and an investigation of the factors influencing the quality and palatability of meat in cooperation with the U. S. Department of Agriculture and 27 of the experiment stations.

A report of the numbers of permanent livestock in the Province of Buenos Aires on July 1, 1923 [trans. title], A. V. Acerboni (*Dir. Gen. Estadís. Prov. Buenos Aires, Estud. e Invest. No. 1 (1924), pp. [23], pls 6*).—Mainly a compilation of the numbers of different classes of livestock within the different divisions of Buenos Aires, with comparisons for various years.

Cattle breeding: Proceedings of the Scottish Cattle Breeding Conference, edited by G. F. FINLAY (*Edinburgh: Oliver & Boyd, 1925, pp. X+495, figs. 56*).—The following papers were presented at the Scottish Cattle Breeding Conference held in Edinburgh in July, 1924: The Origin of Cattle, by J. C. Ewart (p. 1–16); The History of Stockbreeding and the Formation of Breeds, by J. Wilson (pp. 17–25); Inheritance in Cattle, by L. J. Cole (pp. 26–46); Transmission of Colours, by J. Cameron (pp. 47–49); Lethal Factors in Animals, by C. Wriedt (pp. 50–57); The Inheritance of Milk and Beef Characters, by G. F. Finlay (pp. 58–80); Sex-determination and Sex-differentiation in Cattle, by F. A. E. Crew (pp. 81–94); The Reproductive Functions in the Cow (pp. 95–100) and The Development of the Udder in the Cow (pp. 101–105), both by J. Hammond; Cattle Breeding Problems, by W. F. M'Laren (pp. 106–125); Relation between Genetics and Practical Cattle Breeding (p. 126–145) and Prepotence in Character Transmission (pp. 146–163), both by E. N. Wentworth; Inbreeding in Relation to Cattle, by L. J. Cole (pp. 164–175); "Family" Breeding and Line Breeding, by J. A. S. Watson (pp. 176–182); The Selection Problem in Animal Breeding, by D. Kislovsky (pp. 183–194); Character Correlations, Live Stock Judging, and Selection for Type (pp. 195–211) and Breed, Show, and Market Standards (pp. 212–236), both by E. N. Wentworth; Performance Standards and Progeny Tests, by L. J. Cole (pp. 237–253); The Advanced Registry System of the Holstein-Friesian Association of America, by J. A. Reynolds (pp. 254–269); The Interpretation of Milk Records, by H. G. Sanders (pp. 270–276); The Need for a Uniform System of Stating Milk and Butter-fat Records, by J. Mackintosh (pp. 277–281); Inheritance of Colours and Horns, by J. A. S. Watson (pp. 285–287); The Canadian Bison-cattle Cross, by R. S. Hamer (pp. 288–298); Dairy Cattle Breeding Investigations of the United States Department of Agriculture, by R. R. Graves (pp. 299–305); Building Up a Dairy Herd from Scrubs, by A. C. M'Candlish (pp. 306–316); The Wisconsin Experiment in Cross-breeding Cattle, by L. J. Cole (pp. 317–327); The Inheritance of Percent Fat Content and Other Constituents of Milk in Dairy Cattle, by W. W. Yapp (pp. 328–334); Inheritance of Black and Red Coat Colours in Cattle, by M. H. Campbell (pp. 335–344); Genetic and Physiological Analysis of Cattle Problems, by J. W. Gowen (pp. 345–377); Shorthorn Breeding in America, by W. A. Cochel (pp. 381–391); The Cattle Industry of Canada, by R. S. Hamer (pp. 392–426); Milking Shorthorn Cattle of Australia, by J. T. Cole (pp. 427–439); Africander Cattle, by T. G. W. Reinecke (pp. 440–453); Cattle Breeding in Nigeria, by F. R. Brandt (pp. 454–464); The Present Conditions of Cattle Farming in Japan, from the Department of Agriculture and Commerce of Japan (pp. 465–481); and The World's Cattle Situation and Prospects, by E. W. Shanahan (pp. 482–488). A foreword by R. Greig is given.

Felix Renick, pioneer, C. S. PLUMB (*Ohio Archaeol. and Hist. Quart., 33 (1924), No. 1, pp. 3–66, pl. 1, figs. 6; also Columbus: F. J. Heer Ptg. Co., 1924, pp. 67, pl. 1, figs. 7*).—A historical account of the life and work of Felix Renick, a pioneer importer and breeder of Shorthorn cattle in Ohio.

The Ansbach-Triesdorf cattle [trans. title], E. BEUTNER (*Ztschr. Tierzüchtung u. Züchtungsbiol., 3 (1925), No. 1, pp. 1–124, figs. 16*).—This monograph gives a historical account of the origin, development, and breeding of Ansbach-Triesdorf cattle, describing their characteristics, measurements of various parts of animals of different ages, productive capacity, and present importance as a cattle breed.

Investigations of the cranial structure of brachycerous cattle of Polje in Podgorica (southern Montenegro) [trans. title], L. ADAMETZ (*Ztschr. Tier-*

züchtung. u. Züchtungsbiol., *3 (1925), No. 2, pp. 209–221, figs. 4*).—Various skull measurements of five brachycerous cattle are reported and discussed.

Beef cattle, W. TOOLE (*Ontario Dept. Agr. Bul. 310 (1925), pp. 48, figs. 23*).—This bulletin gives brief discussions of the breeds of beef cattle, with directions for feeding, management, and breeding.

Review of beef cattle experimental work at Kansas Experiment Station, B. M. ANDERSON (*Cattleman, 11 (1925), No. 11, pp. 63, 64*).—Four lots of steers averaging 415 lbs. each in live weight were used for comparing the advisability of adding supplements of 1 and 2 lbs. of cottonseed meal or 1 lb. of linseed meal per head daily to a ration consisting of a full feed of cane silage and corn plus 2 lbs. of alfalfa hay daily. One lot receiving the basal ration only made average daily gains during the 165-day experiment of 1.88 lbs. per head and required 476 lbs. of corn, 106 lbs. of alfalfa hay, and 574 lbs. of silage per 100 lbs. of gain. The lot receiving the supplement of 1 lb. of cottonseed meal per head daily made average daily gains of 2.12 lbs. and required 422 lbs. of corn, 94 lbs. of alfalfa, 509 lbs. of silage, and 42 lbs. of cottonseed meal per 100 lbs. of gain. The lot receiving supplements of 2 lbs. of cottonseed meal daily made average daily gains of 2.10 lbs. and required 413 lbs. of corn, 95 lbs. of alfalfa, 514 lbs. of silage, and 80 lbs. of cottonseed meal per 100 lbs. of gain. The fourth lot receiving the supplement of 1 lb. of linseed meal made average daily gains of 2.10 lbs. and required 430 lbs. of corn, 95 lbs. of alfalfa, 514 lbs. of silage, and 43 lbs. of linseed meal per 100 lbs. of gain. The feeding of 1 lb. of cottonseed meal per head daily was concluded to be more economical than the feeding of no cottonseed meal or the feeding of 2 lbs. per head daily.

In another experiment, 2 lots of 10 steer calves each averaging 452 lbs. were used for continuing the study of grass feeding (E. S. R., 52, p. 467). Both lots were wintered during a 150-day period on a half grain ration, limited amounts of alfalfa hay, 1 lb. of cottonseed meal per head daily, and a full feed of cane silage. Average gains of 328 and 314 lbs., respectively, were made during the winter. Both lots were placed on grass pasture from May 5 to November 1. One lot, which was full-fed ground corn and 1 lb. of cottonseed meal per head daily, made average daily gains of 2 lbs. The other lot, which was full-fed corn and 1 lb. of cottonseed meal after August 3, made average daily gains of 1.85 lbs., but the feed costs were much reduced, making the calculated profits greater. Both lots sold for the same price per unit of weight.

Another lot of calves, which was roughed through the winter on silage and cottonseed meal, made average gains of only 132 lbs. per head, but when full-fed on pasture they gained an average of 2.34 lbs. per head daily. The calculated profits were in favor of the calves receiving the half feed of corn.

Beef cattle investigations, 1924–25, C. W. MCCAMPBELL (*Cattleman, 11 (1925), No. 12, pp. 13–16*).—The results of the beef cattle investigations conducted at the Kansas Experiment Station during 1924–25 are reported.

Selling feed crops to feeder steers.—Three lots of steers varying in age and weight were divided into two groups each for this experiment conducted at the Fort Hays Substation. One group of each lot received silage with a little Sudan hay, while the other group received Sudan hay only. It was planned to produce gains of 1 lb. per head daily during the 150-day wintering period, and it was, therefore, found necessary to add 1 lb. of cottonseed cake to the daily ration during the last 60 days of the experiment. The results of the test showed that aged thin steers made better use of the roughage than young thin steers. The importance of feeding silage in the winter was evident from the

greater gains and greater returns per acre of land required to raise the crops. The data for each lot are tabulated in detail.

Alfalfa hay v. Sudan hay for calves.—In continuing the comparison of the feeding value of Sudan and alfalfa hay (E. S. R., 52, p. 369), two lots of calves averaging 400 lbs. each in weight were wintered on each roughage. One lb. of cottonseed cake was fed per head daily during the last 60 days of the 150-day wintering period. The calves receiving the alfalfa hay made average daily gains of 0.73 lb. per head, as compared with 0.47 lb. by the calves receiving the Sudan hay. Approximately equal amounts of roughage were consumed by each lot.

Whole roughage v. cut roughage for stock cows.—Cut and chopped kafir butts and cane butts when fed with 4 lbs. of alfalfa hay per head daily were compared as feeds for beef cows in a 144-day test. The cut feeds proved slightly superior in both cases to the uncut feed.

Sex as a factor in beef production, H. J. GRAMLICH (*Cattleman, 11 (1925), No. 10, pp. 37, 40, 41*).—In comparing heifer and steer calves for feeding purposes at the Nebraska Experiment Station in 1922–23, steers made somewhat greater gains, 2.47 as compared with 2.30 lbs. per head daily, and required less feed per unit of gain.

Another trial lasting 300 days was conducted during 1923–24 with 20 calves in each lot. During the first 250 days the average daily rations of the heifers were 12 lbs. of corn and 4.82 lbs. of alfalfa hay. The steers consumed an average of 12.25 lbs. of corn and 4.54 lbs. of alfalfa hay. The average gains for the period were 546 lbs. for the steers and 485 lbs. for the heifers. The steers required 60 lbs. less corn and 42 lbs. less alfalfa hay per 100 lbs. of gain. One-half of the calves from each lot were marketed at the end of the 250 days, while the remainder were continued on feed for another 50-day period. During this time the heifers made average daily gains of 0.79 and the steers of 1.03 lbs. The feed consumption of both lots was very high during this period, indicating that the limit of profitable feeding may be reached even with calves. The dressing percentages of the heifers were slightly better than those of the steers at the time of slaughter.

Fattening range steers in the Northwest, E. F. RINEHART (*Cattleman, 11 (1925), No. 10, pp. 51, 53*).—The method of feeding cattle on contract, as practiced in the Northwest, is described, with the results of feeding 899 contract steers on 11 farms in Idaho.

Fattening calves for market, H. M. GARLOCK (*Missouri Agr. Col. Ext. Circ. 156 (1924), pp. 8, figs. 3*).—This circular gives popular directions for the care, management, and feeding of beef calves.

Sunflower versus [oat, pea, and vetch] silage for wintering beef cattle, S. BALLANTYNE (*Canada Expt. Farms, Kapuskasing (Ont.) Sta. Rpt. Supt. 1923, pp. 10, 11*).—In this experiment sunflower silage and oat, pea, and vetch silage were fed alternately during four 30-day periods to mature beef cows during the winter. The average daily gains of the cows were very similar, being 1.03 and 1.08 lbs. on the respective rations, and there seemed to be little choice in palatability.

Prolonged fasting as affecting the composition of steers' urine, T. M. CARPENTER (*Natl. Acad. Sci. Proc., 11 (1925), No. 2, pp. 155–160*).—The urines of two previously undernourished steers used in the metabolism work of Benedict and Ritzman (E. S. R., 50, p. 670) were analyzed during a 10-day fast. The samples were mostly collected at 12-hour intervals and determinations made of the volume, total nitrogen, urea nitrogen, ammonia nitrogen, amino acid nitrogen, hippuric acid nitrogen, preformed creatinine, total

creatinine, inorganic sulfate, ethereal sulfate, neutral sulfur, free and conjugated phenols, acetone and diacetic acid, β-oxybutyric acid, total fixed bases, and organic acids. The influence of the fasting on the different constituents of the urine is discussed for the two animals.

Sheep and their care, D. J. Griswold and D. McMahan (*N. Dak. Agr. Col. Ext. Circ. 69 (1925), pp. 100, figs. 23*).—Descriptions of breeds and directions for the feeding, care, management, and treatment of diseases of sheep are given.

Sheep production in Colorado, C. I. Bray (*Colorado Sta. [Bul.] 304 (1925), pp. 44, figs. 28*).—The principles of care, management, feeding, and breeding of sheep are discussed, with special reference to the handling of range flocks.

Definite proof of the relative meat and wool production of Merino mutton sheep in comparison with East Prussian black headed mutton sheep [trans. title], W. Völtz and H. Jantzon (*Ztschr. Tierzüchtung u. Züchtungsbiol., 2 (1924), No. 2, pp. 83–111*).—The increases in weight and various body measurements and wool production during a 168-day experiment were determined for two lots each of 6 Merino mutton lambs and 6 East Prussian mutton (Oxford × Hampshire) lambs. The rations fed consisted of clover hay, fodder beets, peanut cake, and ground oats. One lot of each breed also received 15 gm. of calcium carbonate per head daily. The digestibility of this ration was also determined during a part of this experiment. The lambs used were from 6 to 7 months of age and averaged 27 and 26 kg. in weight in the Merino and East Prussian groups, respectively, at the beginning of the experiment.

The results, which are tabulated and discussed in detail, largely for weekly periods, showed that the average daily gains in live weight per head were for the Merinos with the calcium supplement 0.199 kg. (0.44 lb.) and without the supplement 0.173 kg. The corresponding gains for the East Prussian lambs were 0.182 and 0.179 kg. The feed requirements per unit of gain were less with the Merinos when the calcium carbonate was given than without it, but the East Prussian lambs showed little difference in this respect.

The lambs were slaughtered at the conclusion of the experiment, and the dressing percentages averaged 50.3 and 52.7 per cent for the Merinos with and without the calcium supplement and 50.6 and 51.1 per cent for the corresponding lots of East Prussian lambs. The Merino wool was found to be much superior in quality to the wool produced by the other breed, and the yields per head averaged 5.93 and 4.82 kg. with and without the calcium supplements, respectively, as compared with 3.62 and 3.43 kg. for the corresponding lots of East Prussian lambs. The authors point out the apparent influence of the calcium carbonate supplement in stimulating wool production.

Kemp fibres in the Merino sheep, J. E. Duerden and M. Ritchie (*So. African Jour. Sci., 20 (1923), No. 2, pp. 366–379, pls. 4; also Union So. Africa Dept. Agr., Sci. Bul. 34 (1924), pp. 13, pls. 5*).—The structure of the kemp fiber is described and its microscopical appearance illustrated and compared with Merino fibers.

Contribution to the investigation of Mele wool [trans. title], C. Kronacher (*Ztschr. Tierzüchtung u. Züchtungsbiol., 3 (1925), No. 1, pp. 147–171, figs. 6*).—The fineness of the wool of a flock of Mele and a flock of mutton Merino sheep has been studied. In conducting this work, the diameter was determined at four different places on each of 50 fibers taken from the shoulder, side, and leg, making 600 determinations on each animal. A total of 45,000 measurements of Mele fibers and 27,000 measurements of mutton Merino fibers was used in making the study. The fleeces were classified according to the average fineness, and it was shown that the Merino fleeces were

somewhat finer than the Mele fleeces and showed less variability in the diameter of the fibers, both on the different parts of the same individual and among different individuals. This finding is discussed in detail.

Animal calorimetry.—XXIX, On fat production in a young hog, M. Wierzuchowski and S. M. Ling (*Jour. Biol. Chem., 64 (1925), No. 3, pp. 697–707, fig. 1*).—In continuing the study of metabolism in the pig at the Cornell Medical College,[3] determinations of the protein and fat metabolism were made on a normal animal from 70 to 117 days of age, when it increased from 8.5 to 18.1 kg. in weight.

The ration fed consisted of 700 cc. of milk containing 3.85 gm. of nitrogen, 4 gm. of bone ash, 4 gm. of a salt mixture containing calcium, magnesium, iron, potassium iodide, and iodine, 1 gm. of Harris yeast powder, and from 300 to 700 gm. of cornstarch. In the later experiments 100 gm. of dry milk powder containing 5.6 gm. of nitrogen and 43.5 gm. of lactose were added to the diet. The entire ration was administered daily at 5 p. m. The basal metabolism was determined on 5 different days, each time following a day on which the pig received only 1 liter of whole milk at 5 p. m. The average heat production for the 5 days was 1,085 calories per square meter of surface.

A study of the protein metabolism showed that the pig was able to convert large amounts of milk protein into its own flesh. Increasing the amount of nitrogen supplied daily from 3.85 to 9.45 gm. resulted in increasing the nitrogen of the urine only from 0.99 to 1.17 gm., but further increases in the nitrogen supplied to 15.05 gm. resulted in a distinct increase in the urinary nitrogen to 4.32 gm. In other experiments the hog was given a full feed of starch at 5 p. m. and 200 gm. of starch and 100 gm. of glucose at 10 a. m., after which it was placed in the calorimeter for a study of fat metabolism. Four determinations were made when the pig weighed approximately 15 kg. and at a time when the basal metabolism was determined at 21.1 calories per hour. The consumption of the carbohydrate ration raised the heat production to an average of 42.7 calories per hour and the respiratory quotient from 0.87 to an average of 1.48.

Based on the assumption that 1.7 gm. of fat is produced per liter of CO_2 expired above the nonprotein respiratory quotient of 1, it was calculated that 5.8 gm. of fat equivalent to 55.1 calories were produced hourly from the carbohydrate ration. Further experiments showed that a high respiratory quotient, 1.41, was maintained for 19 and 20 hours after the ingestion of 700 gm. of cornstarch. It was calculated that the fat was produced from starch with a loss of only 5 per cent of its energy. Other results indicated that the heat production calculated by the indirect method agreed within 2.2 per cent with the actual.

[Swine feeding experiments at the Kapuskasing Experimental Station], S. Ballantyne (*Canada Expt. Farms, Kapuskasing (Ont.) Sta. Rpt. Supt. 1923, pp. 12–16*).—The results of two pig feeding experiments are briefly reported.

Pig feeding experiment.—Five lots of six pigs each, averaging approximately 63 lbs. in weight, were selected for comparing self-feeding and pail feeding and the value of tankage as compared with skim milk. The same grain mixture, consisting of equal parts of ground oats, shorts, and barley, was fed to all lots. Lot 1 received the basal ration self-fed, lot 2 the same ration pail fed, lot 3 the basal ration plus 5 per cent tankage self-fed, lot 4 the basal ration self-fed with tankage in a separate self-feeder, and lot 5 received the basal

[3] Jour. Biol. Chem., 60 (1924), No. 3, pp. 583–601.

ration self-fed with skim milk hand fed. The average daily gains per head of the respective lots were as follows: 1.44, 1.49, 1.84, 2.29, and 1.6 lbs. The results showed that pail feeding produced slightly larger gains at lower costs. The pigs receiving tankage made more rapid and more economical gains than those receiving no tankage. Where tankage was self-fed greater gains were made, but the feed costs were also higher.

Comparison of clover pasture v. no clover pasture and the self-feeder v. pail feeding.—Three lots of eight pigs each, averaging approximately 40 lbs. in weight, were selected for a comparison of hand feeding and self-feeding on clover pasture, and for inside hand feeding as compared with hand feeding on pasture. The experiment lasted 91 days, during which the average daily gains were 0.75 lb. for the lot hand fed inside, 0.72 lb. for hand feeding on clover pasture, and 0.71 lb. for self-feeding on clover pasture. All lots received the same ration of finely ground oats, shorts, finely ground barley, and tankage, with skim milk in addition.

Pineapple bran hog feeding experiments, L. A. Henke and R. K. Lum (*Hawaii Univ. Quart. Bul., 4 (1925), No. 1, pp. 18–20*).—Continuing the pineapple bran feeding experiments with hogs (E. S. R., 52 p. 673), three lots of 5 pigs each, averaging approximately 80 lbs. in weight, were selected for comparing wheat middlings and rice bran when fed as components of a mixture of pineapple bran, coconut meal, and tankage in an 85-day experiment. The proportions fed to lots 1 and 2 consisted of pineapple bran 5, wheat middlings or rice bran 3, coconut meal 1, and tankage 1 parts. The third lot received barley and tankage in separate self-feeders. The lot receiving pineapple bran with wheat middlings made an average daily gain of 1.08 lbs. per head as compared with 0.91 lb. for the lot receiving pineapple bran and rice bran, while the lot receiving barley and tankage made an average daily gain of 1.34 lbs. The feed requirements per 100 lbs. of gain were calculated in the respective lots as 424, 498, and 402 lbs.

The authors conclude that wheat bran proved superior to rice bran both in the gains produced and in the calculated costs of gains. The barley and tankage produced rapid gains, but the feed cost was high.

Buttermilk vs. tankage and water, R. G. Newton (*Canada Expt. Farms, Invermere (B. C.) Sta. Rpt. Supt. 1923, p. 5*).—Two lots of five pigs each, averaging 100 and 117 lbs., respectively, in live weight, were selected for comparing buttermilk with tankage and water for fattening growing pigs. The average daily gain per head on the buttermilk ration was 1.6 lbs., as compared with 1.3 lbs. on the tankage and water ration.

Spanish horses, R. Janini Janini (*Internatl. Rev. Sci. and Pract. Agr. [Rome], n. ser., 2 (1924), No. 3, pp. 571–582, pls. 6*).—A historical account of the origin and development of the various types of horses in Spain.

Principles and practice of poultry culture, J. H. Robinson (*Dayton, Ohio: Rel. Poultry Jour. Pub. Co., 1925, [rev. ed.], pp. XVI+584, pl. 1, figs. 512*).—A revised edition of the book previously noted (E. S. R., 26, p. 669).

Concerning the adequacy of synthetic diets for the growth of the chick, A. G. Hogan, N. B. Guerrant, and H. L. Kempster (*Jour. Biol. Chem., 64 (1925), No. 1, pp. 113–124, figs. 5*).—The results of three experiments in raising chickens on synthetic diets are reported from the Missouri Experiment Station which suggest that chicks can not attain normal growth on synthetic diets.

The basal ration used in the first experiment consisted of 20 per cent of casein, 52 per cent of cornstarch, 10 per cent of Crisco, 5 per cent of cod liver oil, 6 per cent of dried yeast, 4 per cent of salts, and 3 per cent of

cellulose. This ration was modified for other lots by replacing the cornstarch with polished rice in one case and adding egg yolk to the basal ration in a third case. A fourth lot of birds received from 2 to 3 hours' exposure to sunlight daily in addition. All of the 5 chicks in each lot receiving the first three rations were raised, but those on the basal ration apparently made subnormal growth and the feathers were ruffled. The feathering was normal in the lot receiving the polished rice, but growth was not quite as uniform as in the lot receiving egg yolk. In a repetition of this experiment, 2 chicks receiving the basal ration developed leg weakness resembling polyneuritis in 2 weeks. This condition was improved by further supplements of yeast to the ration, and the yeast content of the rations of all lots was consequently increased.

In a third experiment 10 per cent of the basal ration consisted of yeast. Another lot received the basal ration, with 5 per cent of the casein replaced by beef muscle which had been extracted with ether, alcohol, and water. Two birds developed polyneuritis on the latter ration and 1 developed polyneuritis on the ration supplemented with egg yolk. Recovery was generally effected by supplying additional yeast to the affected individual.

The authors conclude that this type of leg weakness is not associated with a lack of the antirachitic vitamin. When such deficiency, though slight, is continued over a long period, the injury becomes permanent, resulting in deformed legs. The authors suggest the operation of an unknown factor in the growth requirements of chicks which was included in the polished rice and egg yolk added to the rations.

Feeding experiments with chicks kept in confinement, F. G. KRAUSS (*Hawaii Univ. Quart. Bul., 4 (1925), No. 1, pp. 27–29*).—Chicks kept in confinement were fed by five different methods up to 8 weeks of age, the results of which are tabulated. The mortality in the chick pens receiving a standard scratch and mash consumed in approximately equal amounts, with skim milk ad libitum, was 12 per cent, and without skim milk 10 per cent. When minerals were added to this ration the mortality was 8 per cent, but when 0.5 per cent of yeast was added the mortality increased to 24 per cent, and when 2.5 per cent of cod liver oil was added the mortality was 30 per cent. It was calculated that the chicks in all lots except those receiving yeast gained over 625 per cent in weight during the 8 weeks. Those receiving yeast gained 464 per cent.

In other experiments, pineapple bran has been found unsatisfactory as an ingredient of the ration of laying hens.

The feeding of corn and its parts to mature cockerels in confinement, C. W. CARRICK (*Poultry Sci., 4 (1925), No. 5, pp. 199–204, figs. 3*).—Five lots of 2 cockerels each fed in individual cages were selected for comparing the feeding value of various corn products at the Indiana Experiment Station. All lots received grit and water in addition to the corn product.

The 2 birds receiving degerminated white corn developed polyneuritis in 22 and 24 days, respectively, one recovering after forced feeding on commercial corn germs. One bird receiving the degerminated white corn and corn bran (8.6:1.4) was removed on the fifty-sixth day after developing a cold. The other bird on this ration maintained its weight for about 40 days, after which the weight declined and polyneuritis developed on the eighty-third day. The birds receiving rations of degerminated white corn and corn germs (8:2) and whole yellow corn or cracked yellow corn remained in normal condition to the end of the experiment at 90 days. Birds receiving whole corn produced almost steady gains throughout, making average increases in weight

of 1 lb., while those receiving cracked corn gained an average of 0.8 lb. up to 48 days, after which they decreased to practically their original weight.

The author concludes that corn germ is apparently rich in the antineuritic vitamin.

Poultry management at the University of New Hampshire, A. W. RICHARDSON and F. E. MATHER (*N. H. Univ. [Agr.] Ext. Bul. 28 (1925), pp. 32, figs. 5*).—This is a revision of Bulletin 18 (E. S. R., 48, p. 476).

Experimental work with poultry [at the Lethbridge Experimental Station], W. H. FAIRFIELD (*Canada Expt. Farms, Lethbridge (Alta.) Sta. Rpt. Supt. 1923, pp. 36–39*).—Results of the following experiments are briefly reported:

Line breeding v. outcrossing.—In comparing the fertility, hatchability, and mortality of the chicks hatched from eggs fertilized by line-bred cockerels and by outcrossed cockerels, no advantage was shown for the outcrossed animals when vigorous line-bred cockerels were used.

Comparison of fertility of eggs and mortality of chicks from pullets v. hens.—In a comparison of hens and pullets for breeders, it was found that hens' eggs were invariably about 5 per cent better in fertility, and the mortality of the chicks from hens' eggs was from 3 to 8 per cent less.

Comparative value of water, buttermilk, and both buttermilk and water as drink in breeding pens as shown by fertility and hatchability of eggs and mortality of chicks.—The eggs from a pen of 10 hens receiving buttermilk only to drink were 83.3 per cent fertile and 65.4 per cent hatched as compared with 87.5 per cent in fertility and 71.8 per cent in hatchability for the eggs of a like number of birds receiving buttermilk and water, and a fertility of 78 per cent and a hatchability of 53.5 per cent for the eggs of another like lot receiving water only as drink.

Crushed oats v. mixed mill feeds as dry mash for breeding hens.—Two lots of birds were selected for comparing crushed oats with mixed dry mash of bran, shorts, middlings, beef meal, corn meal, and ground oats (2:2:2:2:2:1) for breeding hens. Of the eggs laid by the group receiving crushed oats 71.8 per cent were fertile, while 44.9 per cent hatched. The eggs laid by the group receiving the mixed mash were 78 per cent fertile, and 53.5 per cent hatched.

Relation of humidity in incubators to hatching results.—In this comparison four hatches were much superior when the humidity varied from 55 to 67 per cent to those with a humidity of 33 to 54 per cent. It is pointed out that in the machine operated with no moisture a high percentage of the eggs which pipped failed to hatch.

Effect of different feeding methods on mortality of chicks.—In a comparison of various methods of feeding chicks, the mortality was 4.2 per cent when the birds received a wet mash moistened with tomatoes and eggs and were given boiled water for drinking, 5.3 when receiving a wet mash moistened with raw eggs and given boiled water, 8.1 when a dry mash was fed and boiled water furnished, 18.7 when fed a dry mash with buttermilk to drink, and 15.5 per cent with the commercial dry mash for feed and buttermilk for drinking.

[Experiments with poultry at the Kapuskasing Experimental Station], S. BALLANTYNE (*Canada Expt. Farms, Kapuskasing (Ont.) Sta. Rpt. Supt. 1923, pp. 55–59*).—The results of various experiments with poultry are briefly noted.

Skim milk v. beef scrap.—Lots of hens and pullets were selected for comparing beef scrap fed in separate self-feeders with skim milk for egg production during the six winter months from November 1 to April 30. The results showed that skim milk was superior for pullets since the production was in-

creased and the feed cost decreased. In case of the hens, however, the production was greater and the feed cost less when beef scrap was furnished.

Sprouted oats v. clover.—Lots of 50 hens were used for comparing sprouted oats with clover leaves as sources of green feed during the five winter months from December 1 to April 30. Both lots received similar amounts of scratch feed and mash. The numbers of eggs laid were slightly in favor of the sprouted oats group, but the cost per dozen was also higher.

Age of birds and winter production.—Early hatched pullets, late hatched pullets, and 1-year-old and 2-year-old hens were used for studying the effect of age on production during the 5-month period from December 1 to April 30. The 10 best birds of each age were selected as representatives. During the 5-month period the yearlings laid an average of 368 eggs, the 2-year-olds 303, the early pullets 455, and the late pullets 243 eggs. It is thus shown that all the others were higher producers than the late hatched pullets.

Crate fattening.—Various rations were compared for fattening birds by the crate method, from which it was concluded that the home-grown feeds were suitable for this purpose, though it is desirable to purchase corn meal to add to the home-grown ration. Milk was found to be very desirable and could not be replaced by tankage and water.

Poultry [investigations at the Virgin Islands Station, 1924], J. B. Thompson (*Virgin Islands Sta. Rpt. 1924, pp. 4, 5*).—A study of the average weight, egg production, and other characteristics of 50 native pullets has been conducted. The average weight of the birds at the end of the first 100 days of the laying test was 2 lbs. 13 oz., with variations from a minimum of 1 lb. 14 oz. to 4 lbs. 1 oz. An average of 24.1 eggs per bird was produced during this time. The individuals varied in egg production from 8 to 56. The weights of the eggs varied from 34.8 to 53.8 gm., averaging 41.1 gm. for all eggs laid. The extreme variability of the birds in type as well as in egg production and weight is pointed out.

Cantonese—a new breed of poultry, F. M. Fronda (*Jour. Heredity, 15 (1924), No. 9, pp. 371–376, figs. 5*).—The characteristics of this dual-purpose breed of poultry, which originated in the vicinity of Canton, China, are described. The breed has proved very satisfactory in the Philippines and is being improved at the University of the Philippines. A standard for the breed is suggested.

Poultry breeding records, W. A. Lippincott (*California Sta. Circ. 299 (1925), pp. 31, figs. 23*).—A slight revision of Kansas Station Circular 99, previously noted (E. S. R., 50, p. 174).

Cull your flock, J. G. Halpin, J. B. Hayes, and C. E. Lampman (*Wis. Agr. Col. Ext. Circ. 180 (1925), pp. 14, figs. 5*).—Popular directions for culling laying flocks are given.

The duck industry in the Philippines, C. X. Burgos (*Philippine Agr. Rev., 17 (1924), No. 2, pp. 87–99, pls. 4, figs. 3*).—Duck production in the Philippines is discussed, including descriptions of the different types, feeding, care, management, and diseases of ducks. The comparative egg production, feed consumption, egg weights, fertility, and hatchability of the eggs of Indian Runner and native white ducks are given in the appendix.

Turkey raising in Missouri, N. Hall (*Missouri Poultry Sta. Bul. 37 (1925), pp. 5–24, figs. 6*).—This is a popular presentation of the methods of breeding and management of turkeys, together with descriptions of the more common diseases and suggestions for treatment.

Raising fur-bearing animals, H. Patton (*Chicago: Author; London: Wheldon & Wesley, 1925, pp. XIV+466, figs. 99*).—This deals with the general

principles to be observed in the raising of fur-bearing animals in captivity. Special portions of the book deal with the raising of the muskrat, fox, mink, raccoon, otter, marten, pekan, ermine, beaver, opossum, skunk, guinea pig, rabbit, etc.

Fur rabbits, M. W. Meek (*Arcadia, Calif.: Author, 1924, pp. 126, figs. 44*).—Descriptions of the different kinds of fur rabbits are given, with reference to their management, feeding, and the dressing and preparation of the fur.

DAIRY FARMING—DAIRYING

The effect of ultra-violet light on the mineral metabolism of the lactating animal (preliminary communication), J. B. Orr, H. E. Magee, and J. McA. Henderson (*Biochem. Jour., 19 (1925), No. 4, pp. 569–572*).—In three experiments at the Rowett Research Institute, the average daily calcium balance of milking goats was changed from −0.24 gm. to +0.16 gm., −0.41 to −0.20 gm., and −0.26 to −0.01 gm. by ultra-violet light irradiation during a 4-hour period daily. The increased calcium retention was almost entirely accounted for by a reduced excretion of calcium in the feces. The authors believe that this is the result of an increased resorption of calcium from the intestines rather than from a decreased excretion into the intestines. These results confirm those of Hart, Steenbock, and Elvehjem (E. S. R., 53, p. 464).

The influence of soy bean cake on the dairy cow and on the milk. Mixed milk with an abnormally low fat content and its cause [trans. title], Lütkefels (*Ztschr. Fleisch u. Milchhyg., 35 (1925), No. 20, pp. 316–321*).—An investigation of the production of milk having a very low fat content led to a study of the attending conditions. It was found that the cows were receiving very large amounts of soy bean cake in their ration, and further studies indicated that soy bean meal tended to produce large amounts of milk with a low fat percentage. Analyses of morning and evening milk showed that very great differences, in some cases over 100 per cent, existed in the fat percentage of milk produced at the two different milkings from the same individual cow. This was attributed to the difference in the time between milkings.

Corn silage v. half roots and half corn silage for milk production, W. A. Munro (*Canada Expt. Farms, Rosthern (Sask.) Sta. Rpt. Supt. 1924, p. 11*).—Eight cows were used during three 3-week periods for comparing corn silage with half roots and half corn silage for milk production. The corn silage ration was fed during the first and third periods in amounts of 60 lbs. per head daily. During the second period 30 lbs. of corn silage and 30 lbs. of mangels were supplied. The average milk production during the second period was 25.21 lbs. per head daily, while the average for the first and third periods was 24.91 lbs., the results thus being practically equal.

Dairy cattle, J. C. Steckley (*Ontario Dept. Agr. Bul. 311 (1925), pp. 48, figs. 18*).—The breeds of dairy cattle are briefly described and directions are given for their feeding, management, and breeding.

VETERINARY MEDICINE

Some recent advances in veterinary helminthology, T. W. M. Cameron (*Vet. Rec., 5 (1925), No. 43, pp. 919–931*).—This is a review of some recent discoveries relating to helminth parasites of the domestic animals.

Metazoan parasites of Philippine domesticated animals, M. A. Tubangui (*Philippine Jour. Sci., 28 (1925), No. 1, pp. 11–37, pls. 3, figs. 2*).—A total of 81 species are recorded as parasites of domestic animals in the Philippines, 5 of

which are described as new to science. A list of hosts and their parasites and a bibliography of 29 titles are included.

New and nonofficial remedies, 1925 (*Chicago: Amer. Med. Assoc., 1925, pp. 461+XL*).—This report continues for 1925 the series previously noted (E. S. R., 53, p. 278).

[Report of the] division of animal industry, J. P. IVERSON (*Calif. Dept. Agr. Mo. Bul., 13 (1924), No. 7–12, pp. 180–190*).—This includes an account of the occurrence of and work with the more important infectious diseases of livestock during the year.

First progress report of the Foot-and-Mouth Disease Research Committee, W. B. LEISHMAN ET AL. (*London: Min. Agr. and Fisheries, 1925, pp. 39, pls. 5*).—This is a report, made in July, 1925, by a committee of ten, appointed on March 4, 1924, by the Ministry of Agriculture and Fisheries to initiate, direct, and conduct investigations into foot-and-mouth disease, either in Great Britain or elsewhere, with a view of discovering means whereby the invasions of the disease may be rendered less harmful to agriculture. The main report (pp. 5–17) is followed by three appendixes, which include (1) conditions governing the distribution of virus (p. 18), (2) a detailed report of work at the ministry's laboratory at New Haw, Weybridge (pp. 19–26), and (3) a detailed report of work at the Lister Institute of Preventive Medicine, London (pp. 27–39). The investigations, the details of which are presented, have led to the following conclusions:

"The vesicle fluid collected from guinea pigs (in the case of the virus GF) is usually of a very high virulence. After dilution 1 in 500,000 or 1,000,000 the fluid is still capable of infecting guinea pigs by intracutaneous inoculation of the sole, in a dose of about 0.05 cc. The results of testing the potency of the virus by titration have been remarkably regular, showing the uniform susceptibility of the guinea pig and the practicability of the method for further research. Attempts at culture in a large variety of media, including that recommended by Frosch and Dahmen, have completely failed. No appreciable concentration of the virus in vesicle fluid was obtained by centrifugation at a speed of 5,500 for 2 hours. Attempts to absorb the virus from vesicle fluid by means of red blood corpuscles and precipitates formed in different ways have proved unsuccessful.

"The keeping properties of the filtered virus are very easily affected by slight changes in the reaction of the fluid in which it is suspended. The optimum reaction was a pH of 7.5, and slightly increased acidity or alkalinity had a harmful effect. The addition of a phosphate solution had a beneficial effect on the viability. Vesicle fluid filtered and diluted 1 in 500 with phosphate solution of pH 7.6 remained active for 4 or 5 days in the incubator at 37° C. In a solution of sodium chloride of pH 7.0, the activity had disappeared in 24 hours. This is in agreement with the statement of most previous workers that the virus always dies at 37° in 24 or at most in 48 hours, since these writers did not use phosphate solutions to regulate the reaction. The virus will remain active in epithelium from vesicles on guinea pigs' feet for many weeks at 4° if kept in a 50 per cent solution of glycerin in salt solution. The virus has been found to be highly resistant to such agents as alcohol and chloroform. If vesicle fluid is diluted 1 in 50, filtered, and rapidly dried, the virus has been found to remain active for at least 7 days at 37° and for at least 6 weeks at 18° when kept in a dry atmosphere over pure sulfuric acid.

"The statements of laboratory workers on the Continent that guinea pigs can be easily and regularly infected with foot-and-mouth disease have been confirmed. It is important that the guinea pigs should be not less than 300

gm. and, if possible, 350 gm. in weight, otherwise the results are less regular. The most convenient method of infection of guinea pigs is by intracutaneous inoculation of the plantar surface of the hind foot; the results of scarification of the same region are almost as satisfactory. Primary vesicles appear at the site of inoculation usually in 20 to 24 hours, and within 48 hours lesions are found in the mouth and on the fore feet. The blood is always infective during the maximum development of the primary vesicles. No instance of spontaneous transmission from an infected to a susceptible guinea pig has been observed. Immunity was always present one month after infection and appeared to be complete.

"Attempts to infect rats and mice have met with the following results: A certain number of wild rats inoculated with very large doses of virus developed vesicles in the mouth and retained the virus in the blood for 24 and sometimes 48 hours. White rats inoculated on the feet have shown very slight evidence of infection, but the local tissues of the feet have remained infective for 3 days. Five white rats and 15 white mice inoculated intramuscularly have shown no symptoms of infection, and their blood has not been infective on the second day from inoculation. The blood, however, of one further rat was slightly infective. Ten house mice have been inoculated into the muscles, and the blood of 6 of these has proved infective. No lesions could be found on the feet or in the mouth. Wood mice inoculated intramuscularly were always shown to have infective blood 2 or more days later, and immunity resulted. In 6, small vesicles were found on the tongue. No evidence of infection could be found after feeding mice with infective material. No natural transmission of the disease from rat to rat, mouse to mouse, or from mouse to guinea pig could be obtained.

"Attempts to transmit the disease from guinea pig to guinea pig by means of bugs (Cimex) failed. A virus which has passed many times through the guinea pig appears to maintain a constant virulence for these animals."

Observations and experiments on rinderpest, C. S. Gibbs (*China Jour. Sci. and Arts, 3 (1925), No. 7, pp. 399–409, pls. 2*).—This is a report of studies made during the rinderpest epidemic in China in 1924, which was especially virulent and widespread, extending through Shautung, Honan, and north Anhwei. While no cure was discovered for advanced cases of rinderpest, the disease was successfully treated prophylactically and immunologically. Prophylaxis was secured by injecting large doses of the immune serum intravenously during the early stages of the disease. Immunity was developed in healthy animals by specific vaccinations.

"When standard antirinderpest serum was administered along with tested immune rinderpest bile, the protection against natural infection was immediate and lasted about five weeks. The simultaneous inoculation of antirinderpest serum and rinderpest blood produced indefinite immunity."

The sequelae of rinderpest and the germ carriers [trans. title], G. Curasson (*Rev. Gén. Méd. Vét., 34 (1925), No. 406, pp. 549–554*).—This account is by the chief of the Zootechnique and Epizootic Service of the French Sudan. It is pointed out that the milk, vaginal discharge, excrement, and blood of animals recovered from the disease may remain virulent.

A contribution to the investigation of tristeza, I [trans. title], F. Rosenbusch and R. Gonzalez (*Arch. Protistenk., 50 (1925), No. 3, pp. 443–485, figs. 9; abs. in Trop. Vet. Bul., 13 (1925), No. 3, pp. 78, 79*).—This is an account of infections of Babesia and Anaplasma in cattle, which the authors include under the term tristeza. Babesiasis and anaplasmosis occur in all cattle

tick infested areas. When set up by inoculation, the former shows an incubation period ranging from 3 to 18 days and the latter from 17 to 38 days.

Serological studies on bovine infectious abortion, J. G. McAlpine and L. F. Rettger (*Jour. Immunol., 10 (1925), No. 5, pp. 311–328, figs. 10*).—This is a contribution from Yale University and the Connecticut Storrs Experiment Station, cooperating. It is pointed out that "reacting cows may be divided into three main groups by testing their sera and milk at monthly intervals and titering to the end point. One of these groups comprises animals whose udder secretions constantly exhibit reacting bodies of both classes. The second is made up of cows in the milk of which the so-called immune bodies are present only during the colostral and drying off periods, while in the third group the complement-fixing bodies are never present in the milk. Animals classified in the second group constituted 50 per cent of the cows under observation.

"All calves, regardless of the reaction of the dam, are born nonreactors to both the agglutination and complement fixation tests. If they are permitted to suck positive dams within the first 24 hours of life, they become reactors in a remarkably short time, but again become negative almost invariably before the sixth month of age. On the other hand, if they ingest the colostrum of negative dams, they remain negative unless they become infected from without during or after sexual maturity."

A list of 22 references to the literature is included.

Diseases of Colorado feeding lambs, I. E. Newsom and F. Cross (*Colorado Sta. Bul. 305 (1925), pp. 26, figs. 18*).—This summary of information describes briefly the more common causes of loss of lambs on winter feed. The heaviest losses are grouped under two general heads, those associated with shipping, including hemmorrhagic septicemia and the dysenteries, and those due to errors in diet, the chief error being the consumption of too much grain.

Helminth parasites of hogs in the Philippine Islands, B. Schwartz (*Philippine Jour. Sci., 27 (1925), No. 2, pp. 227–233, pls. 2*).—Notes are presented on 11 species observed by the author.

Santonin and oil of chenopodium compared in the treatment of ascariasis of swine, F. B. Young (*North Amer. Vet., 6 (1925), No. 11, pp. 21–23*).—The results of the administration of santonin and oil of chenopodium to 441 pigs in 7 herds are presented in tabular form. They led to the conclusion that santonin is a safe ascaricide, is easy to administer, and gives good results in the field, and that, while oil of chenopodium is also an effective ascaricide, it is difficult to administer and is also very toxic.

The use of Bayer 205 in equine surra in the Dutch East Indies [trans. title], C. Bubberman, J. B. Douwes, and V. E. C. Van Bergen (*Dept. Landb., Nijv. en Handel* [*Dutch East Indies*], *Veeartsenijk. Meded., No. 50 (1925), pp. 64; abs. in Trop. Vet. Bul., 13 (1925), No. 3, pp. 73–76*).—The authors conclude that thus far the most promising treatment for surra appears to be the simultaneous administration of Bayer 205 and atoxyl, both in nonlethal but slightly toxic doses.

The diseases of the cat and its general management, H. Kirk (*London: Baillière, Tindall & Cox, 1925, pp. XIV+418, figs. 63*).—Diseases of the cat and their treatment are here dealt with at some length.

The effect of feeding Bacillus acidophilus, lactose, dry skim milk, or whole milk on the hydrogen ion concentration of the contents of the ceca of chickens, J. R. Beach (*Hilgardia* [*California Sta.*], *1 (1925), No. 8, pp. 145–166*).—This is a report of experiments undertaken to determine in what manner, if any, the H-ion concentration of the cecal contents of chicks is in-

fluenced by feeding them with milk or certain milk products, and the relation of any changes found to occur to the control of coccidiosis.

"Feeding milk cultures of *B. acidophilus* to chickens resulted in the implantation of *B. acidophilus* in the ceca. In some instances nearly 100 per cent of bacteria present in smears of the cecal contents stained by Gram's method were of the acidophilus type. The implantation of *B. acidophilus* in the ceca of chickens, however, did not change the pH value of the cecal contents. The part of the droppings of chickens originating in the ceca are voided separately and can be differentiated from the part of the droppings from other portions of the intestinal tract. It is possible, therefore, to study changes in the cecal contents of the same chicken that occur from day to day. The pH of the cecal contents of chickens was changed from the normal range of 6.0 to 7.4 to a range of 4.4 to 5.6 by feeding sufficient amounts of whole sweet milk, milk cultures of *B. acidophilus*, milk cultures of *B. acidophilus* plus lactose, lactose alone, or dry skim milk.

"Since lactose is the only ingredient common to all of the milk products used, the change in H-ion concentration of the cecal contents produced by feeding milk or a milk product would appear to be due to the lactose it contains. The change is the H-ion concentration of cecal contents from a single feeding of a milk product occurred within 2 to 2.5 hours after the feeding and returned to normal within 8 to 24 hours after the feeding. The rapidity of development and the short duration of the change in H-ion concentration indicates that it is not a result of modification of the flora of the intestinal tract. An abnormal degree of acidity in the ceca was constantly maintained by the individual administration to chickens of 1 or 2 gm. of lactose twice each day at an interval of about 8 hours, or by the continuous feeding of mash mixtures containing 20 per cent of lactose. The feeding of mash containing 40 per cent dry skim milk would also provide approximately 20 per cent of lactose in the mash and should, therefore, accomplish the same result."

The influence of feeding lactose or dry skim milk on artificial infection of chicks with Eimeria avium, J. R. Beach and D. E. Davis (*Hilgardia [California Sta.], 1 (1925), No. 8, pp. 167–181*).—This is a report of five trials in which it was attempted to combat artificially produced coccidial infection in chicks by feeding them with sufficient lactose or dry skim milk to change the H-ion concentration of the ceca from the normal range of 6.0 to 7.4 to a range of 4.4 to 5.6. It was thought that, by this means, an environment unfavorable or destructive to the tissue-invading stages of the parasite, namely, the sporozoites and merozoites, might be created.

"The results of the series of five experiments were uniform in demonstrating that chicks were afforded a considerable degree of protection against coccidial infection when a sufficient amount of lactose or dry skim milk was added to their diet. In the [three] trials carried out under laboratory conditions, this was accomplished equally well by the individual administration of two 1-gm. doses of lactose to each bird daily at an interval of about eight hours or by feeding chicks continuously with mash containing 20 per cent lactose or 40 per cent dry skim milk. In the [two] trials carried out under field conditions, however, the results obtained from the use of skim-milk powder were superior to those obtained from the use of lactose. This was due, at least in part, to the fact that the chicks did not relish the mash mixture containing lactose and, therefore, consumed less of this mash than of that containing dry skim milk. The relatively greater increase in weight of the chicks fed on dry skim milk indicated that the superior food value of this

material was also at least in part responsible for the benefit derived from its use.

"The results of these experiments confirm those described in the preceding paper, in showing that, when sufficient lactose or dry skim milk is fed to chickens, the H-ion concentration of the cecal contents can be kept within a range of 4.4 to 5.6. It is thought that this degree of acidity may be sufficient to injure or destroy the sporozoite or merozoite forms of *E. avium*, and that serious harm from the infection is thereby prevented. However, both merozoites and oocysts were found in the droppings of birds inoculated with sporulated oocysts and treated with lactose or dry skim milk, even though the birds showed no visible signs of sickness after the inoculation. This is evidence that at least a part of the sporozoites released from the sporocysts were unharmed and invaded the cells of the cecal mucosa, where both the sexual and asexual cycles of development were completed. A possible explanation of this is that the dose of sporulated oocysts given was too large to be entirely overcome and, therefore, a portion of the sporozoites escaped. Another possible explanation is that the acidity in the ceca was more destructive to the merozoites than to the sporozoites. In such a case, the invasion of the epithelial cells by the sporozoites and the completion of the developmental cycles within the cells would be unhindered. The merozoites, however, upon emergence from the epithelial cells into the acid cecal contents would be destroyed and further development of disease arrested. On this basis, the appearance of blood in the droppings and death on the fifth and sixth days after inoculation of some of the birds which were fed lactose or skim-milk powder could be ascribed to the tissue damage resulting from the initial invasion with sporozoites. The destruction of the merozoites, however, prevented further development of diseases in the birds which were not fatally injured by the sporozoite invasion.

"This explanation would not apply to the failure of lactose feeding in the last two coccidiosis control trials to afford the chicks as high a degree of protection against coccidial infection as was given by dry skim milk. This, as previously pointed out, was probably due in part to the difference in amount of consumption of the two mash mixtures by the chicks (12.8 per cent less of lactose) and also in part to the superior food value of the skim-milk powder."

Control of bacillary white diarrhea, W. R. Hinshaw (*North Amer. Vet., 6 (1925), No. 11, pp. 31–34*).—The author concludes that the elimination of adult carriers of bacillary white diarrhea infection, coupled with a sanitary program, is the ideal way to control this disease in chicks. The use of sour milk and medicinal agents may be of some value in prevention, but curative measures should not be attempted in most cases.

Fowl typhoid: A comparison of various European strains with those of North America, B. F. Kaupp and R. S. Dearstyne (*Poultry Sci., 3 (1924), No. 4, pp. 119–127, figs. 6*).—In investigations at the North Carolina Experiment Station, the authors have found such physiological and morphological differences as exist between the European and the American strains studied to be so slight as to be negligible. Their efforts to prove that the disease is transmitted through eggs have thus far been unsuccessful, although an organism has been isolated from eggs laid by an artificially infected bird which has the morphological and physiological characteristics of *Bacterium sanguinarium*. However, the authors have been unable to produce death with it through artificial infection, though mild symptoms of typhoid have been produced. It is pointed out that field history would tend to refute the theory that the disease is transmitted through the eggs, inasmuch as the disease seems to confine itself for the most part to adults.

AGRICULTURAL ENGINEERING

River gauging, M. A. Hogan (*London: [Gt. Brit.] Dept. Sci. and Indus. Research, 1925, pp. VIII+70, pls. 18, figs. 8*).—A report is presented on methods and appliances for river gauging suitable for use in Great Britain. The use of the sharp-edged weir without side contractions is suggested for gauging small streams. For larger rivers, under natural conditions of flow, the stage discharge curve should be used, current meters being used to measure the flow. The discharge of canalized rivers should be measured by calibrating a weir by a combination of model experiments and current meter measurements.

Tests of current meters are reported which showed that for low velocity the Price and Amsler meters give sufficiently good results down to a velocity of 0.5 ft. per second, and the Stoppani meter gives satisfactory results at velocities of 0.75 ft. per second and over. No serious difference was observed between the results obtained in large and small channels. The error caused by obliquity was found to be increased in a small channel, and it appeared that the Stoppani meter has a maximum error of only ± 5 per cent, due to oblique flow, while the error in an unsealed screw meter, such as the Amsler or Ott, may be as much as —25 per cent.

Other tests at low velocity showed that the records of a weight driven meter at various velocities are greatly influenced by the pitch of the blades. A pitch of 30° seems to give the best results. The results for a given pitch were dependent on the value of the driving weight, which must be neither too large nor too small. With a suitable helix and weight the still water rating gave a curve which seems suitable for measuring purposes. In moving water the velocity given by the meter using the still water rating curve was too low at low velocities, and the individual observations showed large discrepancies.

Descriptions of three typical current meters are appended.

Nine charts for flow of water in channels, G. Higgins (*Engin. and Contract., Water Works, 64 (1925), No. 3, pp. 607–613, figs. 9*).—Nine charts are presented and discussed, which are based upon Bazin's formula for channels.

The improved Venturi flume, R. L. Parshall (*Amer. Soc. Civ. Engin. Proc., 51 (1925), No. 7, [pt. 3], pp. 1340–1349, figs. 4*).—In a contribution from the Colorado Experiment Station and the U. S. D. A. Bureau of Public Roads, a device is described for measuring the rate of flow of either small or large quantities of water. It has no moving parts, is simple and inexpensive, utilizes the principle of a hydraulic control, and sacrifices little head. The improvements over the old Venturi flume consist in the reduction of the convergence in the inlet section, lengthening of the throat section, change of divergence of the outlet section, and depressing the floor in the throat section. These changes have been found to improve the flow conditions, reduce the effect of submergence, and simplify the operation by reducing the number of gauges necessary to determine the discharge. Tests are reported which indicate an accuracy of about 5 per cent.

Experiments with the automatic water finder in the trap region of western India, H. H. Mann and D. L. Sahasrabuddhe (*Bombay Dept. Agr. Bul. 72, rev. (1925), pp. 39*).—This is a review of a report previously noted on the subject (E. S. R., 35, p. 286), which includes additional data obtained since that time.

Permissible canal velocities, S. Fortier and F. C. Scobey (*Amer. Soc. Civ. Engin. Proc., 51 (1925), No. 7, [pt. 3], pp. 1397–1413*).—This paper, which is a contribution from the U. S. D. A. Bureau of Public Roads, constitutes the final report of the special committee on irrigation hydraulics of the American Society

of Civil Engineers. The data presented show that the laws of hydraulics governing the movement of loose silt and detritus in open channels are only distantly related to the laws governing the scouring of a canal bed, and are not directly applicable.

The material of seasoned canal beds is composed of particles of different sizes, and when the interstices of the larger are filled by the smaller the mass becomes more dense, stable, and less subject to the erosive action of water. The velocity required to ravel and scour a well-bedded canal in any material is much greater than the velocity required to maintain movement of particles of that same material before becoming bedded, or that have been raveled off by higher velocities than the bed would stand.

Colloids in either the material of the canal bed or the water conveyed by it, or in both, tend to cement particles of clay, silt, sand, and gravel in such a way as to resist erosive effects. The grading of material from fine to coarse, coupled with the adhesion between particles brought about by colloids, makes high mean velocities possible without any appreciable scouring effect.

It is concluded that irrigation canals may be designed for the velocity that is permissible when seasoned by age, as the demand for water grows with the age of the canal and the maximum mean velocity grows with the supply necessary to satisfy this demand. Canals when new may be operated with velocities less than the maximum permissible by the use of check structures. A slight excess of velocity is considered preferable to insufficient velocity.

It is further concluded that the growth of aquatic plants is but partially connected with velocities, and that canals designed for the highest permissible velocities from the standpoint of erosion will be as free from plant growth as design alone can effect.

Land clearing practices in Minnesota, M. J. THOMPSON and A. J. SCHWANTES (*Minn. Univ. Agr. Ext. Spec. Bul. 97 (1925), pp. 12, figs. 3*).—The results of a questionnaire relating to standard practices in connection with various land clearing operations in northern Minnesota are briefly presented. The questionnaire covered practically all phases of land clearing, and the data represent nearly 1,000 acres in eight representative counties of the cut-over district in the State.

It is shown that the average brushing crew consists of two men, and that the ax is the most popular tool for cutting brush. The average number of man hours required to brush an acre was found to be 32.4. It is considered questionable whether the advantages of cutting brush in the late summer to prevent sprouting back will justify this practice under ordinary farm conditions. It was found that sheep must be starved down to the pasture to do any real good from the standpoint of brush removal. Blasting may be done at least one-third cheaper when the soil is full of moisture than when it is dry.

In 40 per cent of the cases some mechanical means of stump removal, consisting of block and tackle, tractor, and horse power stump pullers, was used to supplement explosives. The average total blasting cost per acre was $11.56, including both labor and materials, and the average estimated cost of stumping and burning an acre ready for the plow was $31.53. Over 39 per cent of the breaking plows used were of the 16-in. size, and 8 in. was the most popular depth of breaking.

How to use agricultural explosives, L. O. LE BRON and M. L. NICHOLS (*Ala. Polytech. Inst. Ext. Circ. 88 (1925), pp. 8, figs. 6*).—Practical information on the use of explosives for the blasting of stumps and bowlders is presented.

The use of earth for wall construction, J. D. Long (*Agr. Engin., 6 (1925), No. 7, pp. 148–153, figs. 10*).—In a contribution from the California Experiment Station a historical discussion of the use of earth for wall construction is presented, together with a brief statement of the experimental development of this process at the station. A bibliography is appended.

Standard specifications for corrugated metal pipe culverts (*U. S. Dept. Agr., Dept. Circ. 331 (1925), pp. 6*).—The text of these specifications, adopted by the American Association of State Highway Officials and approved by the Secretary of Agriculture for use in connection with Federal-aid road work, is given.

Rural electric investigation in California, B. D. Moses (*Agr. Engin., 6 (1925), No. 7, pp. 154–157, figs. 3*).—A brief outline of the investigational work on the application of electricity to California agriculture is given, much of which is being done either by or in cooperation with the California Experiment Station. The work includes tests on the use of electricity for mechanical milking, brooding of newly hatched chicks, pumping for irrigation, fruit and vegetable dehydration, heating, spraying, and household operations.

Charts for the establishment of a rational tariff in the distribution of rural electricity [trans. title], M. Pelou and E. Lajoue (*Rev. Gén. Élect., 17 (1925), No. 12, pp. 450–460, figs. 3; abs. in Sci. Abs., Sect. B—Elect. Engin., 28 (1925), No. 332, pp. 387, 388*).—Having indicated the necessity of determining a selling price which will take into account the different elements concerned in rural electricity supply, the authors present charts for the graphical solution of the problem.

On the assumption that the capital charges on a rural line must be covered by the local authorities or by other special arrangements, if the service is to be economically possible, the selling price P_r per kilowatt hour at the consumer's terminals is determined. This price is calculated from $P_r=(P_a\rho)+wt/W)$, in which P_a equals the purchase price per kilowatt hour, high tension, ρ the efficiency of distribution, w the first cost of installation per inhabitant, t the maintenance factor, ranging from 0.015 for lines on reinforced concrete standards to 0.05 for lines on plain wooden poles, and W equals the total annual consumption in kilowatt hours per inhabitant. This equation, containing five variables, is solved by the aid of a chart of the quadrant type, i. e., four distinct sets of curves so arranged that two have the same scale of abscissae and two the same scale of ordinates. The method of construction is fully explained.

Actual charts are presented for calculating the selling price per kilowatt hour at the consumer's terminals, for determining the efficiency of a network, and for determining the mean power factor of a network. Numerical examples are given in each case. The same type of chart can be applied to the solution of many other problems.

A. S. A. E. tractor testing and rating code (*Agr. Engin., 6 (1925), No. 9, pp. 212, 213, 218, figs. 3*).—The text of this code is presented, which is based largely on the procedure followed by the Nebraska Experiment Station in the administration of the tractor inspection law.

The power take-off for tractors, F. N. G. Kranich (*Agr. Engin., 6 (1925), No. 9, pp. 204–208, 216, 217, figs. 9*).—A large amount of information is presented on practical methods whereby power in the form of rotary motion may be transmitted from a tractor engine to a machine unit exclusive of the use of the belt pulley. The points which call for agreement by agricultural engineers are enumerated as speed, manner of attachment to the tractor, height, fore and aft location, location with reference to drawbar, horizontal location, and slip joints.

Installation of electric soil scarifiers [trans. title], A. Petri (*Elektrotech. Ztschr., 46 (1925), No. 12, pp. 405–407, figs. 5*).—Descriptions are given of several types of electric soil scarifiers suitable mainly for gardening purposes. Methods of conveying the electrical current by flexible connections to the machine are discussed, and the use of movable overhead trolleys is described.

Cotton ginning, G. S. Meloy (*U. S. Dept. Agr., Farmers' Bul. 1465 (1925), pp. II+29, figs. 25*).—This contains a general discussion of the mechanical processes of cotton ginning which are important to farmers. The discussion is confined to saw gins.

Grain cleaners in heavy dockage areas, R. H. Black (*Agr. Engin., 6 (1925), No. 8, pp. 180–184, figs. 4*).—In a contribution from the U. S. Department of Agriculture data from general experience on the development of grain cleaners are briefly presented, special attention being drawn to the development of the cleaning devices.

Press work in agricultural machinery plants, C. C. Hermann (*Machinery, 32 (1925), No. 2, pp. 120–122, figs. 6*).—A description is given of the drawing dies used in the production of a gasoline tank and a bowl for a cream separator.

The problem of research in farm equipment, R. W. Trullinger (*Agr. Engin., 6 (1925), No. 9, pp. 214, 215, fig. 1*).—In a contribution from the U. S. D. A. Office of Experiment Stations a brief outline is presented of the situation and need with respect to research in farm equipment, and general suggestions are given as to lines along which such efforts should proceed. The harmonious cooperation between the profession of agricultural engineering, the farm equipment manufacturing industry, and the agricultural industry is suggested as a logical basis of procedure.

Farm buildings for Nebraska, compiled by I. D. Wood and R. M. Loper (*Nebr. Agr. Col. Ext. Circ. 722 (1925), pp. 78, figs. 79*).—A description and price list are given of the farm building plans prepared and approved by the department of agricultural engineering.

Barns, H. B. White and M. G. Jacobson (*Minn. Univ. Agr. Ext. Spec. Bul. 98 (1925), pp. 24, figs. 22*).—Practical information on the planning and construction of farm barns in Minnesota is presented, together with numerous detailed working drawings.

Trench silos in Minnesota, A. Boss, H. B. White, and A. J. Schwantes (*Minn. Univ. Agr. Ext. Spec. Bul. 100 (1925), pp. 7, figs. 5*).—Practical information on the planning and construction of trench silos in Minnesota is presented.

Farm poultry houses, F. E. Mussehl and S. J. Marsden (*Nebr. Agr. Col. Ext. Circ. 1419 (1925), pp. 13, figs. 10*).—Practical information on the planning and construction of poultry houses adapted to Nebraska conditions is presented, together with working drawings.

A method of analysis of ventilation test data, M. A. R. Kelley (*Agr. Engin., 6 (1925), No. 9, pp. 209–211, fig. 1*).—In a contribution from the U. S. D. A. Bureau of Public Roads a method of analysis of ventilation test data by use of the coefficient of correlation is outlined, and a sample data sheet showing the application of the method to ventilation test data is presented.

Farmstead water supply, G. M. Warren (*U. S. Dept. Agr., Farmers' Bul. 1448 (1925), pp. II+38, figs. 25*).—This supersedes Farmers' Bulletin 941 (E. S. R., 40, p. 91). It presents information concerning the sanitary and engineering principles underlying safe, serviceable, and permanent water systems for farmsteads.

The more unusual gases occurring in Imhoff tanks, F. L. Campbell and W. Rudolfs (*Engin. News-Rec., 95 (1925), No. 14, pp. 552, 553*).—Studies con-

ducted by the New Jersey Experiment Stations and the New Jersey State Department of Health on the occurrence of the unusual gases hydrogen and hydrogen sulfide in Imhoff tanks are briefly reported.

At least 50 analyses from Imhoff tanks which were not functioning properly, extending over a period of two years, failed to reveal the presence of hydrogen in the gas from any tank at any time. This is taken to indicate that hydrogen does not appear as the result of every disturbance in tank operation. Hydrogen was found to be absorbed by sludge, but it was not made clear whether or not the disappearance of hydrogen in sludge was due to chemical combination, absorption, or the catalytic action of living organisms. Hydrogen sulfide was found in the gas from a new tank.

RURAL ECONOMICS AND SOCIOLOGY

A land policy for the public domain, G. Stewart (*Econ. Geogr., 1 (1925), No. 1, pp. 89–106, figs. 13; abs. in Utah Sta. Circ. 56 (1925), p. 4*).—The early history of the public domain, especially in the Western States, is sketched. The bad effects of exploitation throughout this period were overgrazing and erosion. Private monopoly of water and the presence of wild horses, rodents, and poisonous plants are other influences which have locally spoiled the range and affected the grazing adversely. Several plans of handling the public domain, similar to those previously noted (E. S. R., 51, p. 688), are suggested.

The public leasehold system in the United States, M. L. Shine (*Jour. Land and Pub. Utility Econ., 1 (1925), No. 3, pp. 322–335*).—The history of the operation of the public leasehold system is illustrated by the experiences of States which donated public lands for universities and public schools and the failure of the system on saline and mineral lands which were originally reserved as sources of national revenue. The quit-rent system, especially in New York State, is shown to have been equally unsuccessful. A few instances are noted in which public leaseholds have been retained by certain States and municipalities with more or less success.

Practical policies of land colonization, B. F. Faast (*Jour. Land and Pub. Utility Econ., 1 (1925), No. 3, pp. 300–304*).—It is stated that the demand for new farms on the frontier is being met by colonization companies who finance settlers, construct roads and farm buildings, and plan towns and villages in preparation for their colonization of new lands.

The evolution of rural property rights and the agrarian reform in Rumania, M. Constantinesco (*L'Évolution de la Propriété Rurale et la Réforme Agraire en Roumanie. Bucharest: Cultura Națională, 1925, pp. 479*).—The author traces the development of relationships between peasants and feudal lords, particularly as it was associated with the struggle for independence and national entity. He relates the history of land reforms and the division of rural property in recent years, including expropriations and the redistribution of land to the peasants. The study is concluded with a review of some of the results of the agrarian reform.

Farming with bluegrass, J. B. Hutson and E. L. Langsford (*Kentucky Sta. Bul. 259 (1925), pp. 63–98, figs. 4*).—The direct returns for 2,770 acres of blue grass in Fayette, Woodford, Clark, and Bourbon Counties, Ky., in 1923 were determined from records kept by 15 farmers cooperating with the department of farm economics at the station and the Bureau of Agricultural Economics, U. S. D. A. These returns were measured in pounds of gain put on beef cattle and bushels of blue grass seed. The gains put on beef cattle ranged from 7 to 182 lbs. per acre, the average being 57.3 lbs. per acre. The blue grass

seed yield ranged from 3.6 to 12.5 bu. per acre, the average being 6.5 bu. per acre. The value of these gains in 1923 ranged from $3.61 to $17.45 per acre, the average being $12.01 per acre. This average was about 6 per cent on the estimated market value of the land.

The organization of a 586-acre blue grass farm as it was actually operated during the years 1922 to 1924, inclusive, and two plans for the proposed organization of a 400-acre farm are shown.

Costs and practices of growing alfalfa in New Jersey, A. G. WALLER and H. B. WEISS (*N. J. Dept. Agr. Circ. 84 (1925), pp. 35, figs. 9*).—In the winter of 1923–24 a survey of the alfalfa industry of New Jersey was conducted cooperatively by the New Jersey Experiment Stations and the State Department of Agriculture, including four counties in the northern and three in the southern part of the State. Personal visits were made to 235 growers.

Labor and use of land were found to be the largest items in the yearly charge against alfalfa. In northern New Jersey, where 2 cuttings were made, the average yield per acre was 2.45 tons, the cost per acre $32.17, and the cost per ton $13.15. Where 3 cuttings were made, the average yield was 3.36 tons per acre, the cost per acre $39.92, and the cost per ton $11.88. In southern New Jersey the average yield per acre, cost per acre, and cost per ton by cuttings were as follows: 2 cuttings, 1.98 tons, $29.79, $15.06; 3 cuttings, 2.95 tons, $38.18, $12.88; and 4 cuttings, 4.4 tons, $39.19, $8.90.

This survey furnished also the basis of a study noted previously (E. S. R., 53, p. 135).

Annual report of the Rural Credit Board for the State of South Dakota (*S. Dak. Rural Credit Bd. Ann. Rpt. 1924, pp. 16*).—A brief history of this department from its organization in 1917 up to and including the year ended June 30, 1924, is given, and a number of financial statements are submitted.

Public expenditures in the agricultural state, H. W. PECK (In *Taxation and Welfare. New York: Macmillan Co., 1925, pp. 43–56*).—One chapter in a survey of the financial and social aspects of taxation deals with agricultural and rural problems attendant upon increasing population. The Government can cope with these by means of investigations, demonstrations, and dissemination of information and advice, for which public expenditure is deemed justified.

Investigation into alleged combine in the distribution of fruit and vegetables, L. DUNCAN (*Ottawa: Canada Dept. Labor, 1925, pp. 184*).—The evidence heard in an investigation of the question as to whether the operations of any combine of middlemen has affected the interests of the producers in Canada constitutes an interim report of the commissioner appointed under the Combines Investigation Act, 1923. It sets forth the conditions as found in the Provinces of British Columbia, Alberta, Saskatchewan, and Manitoba.

The National Live Stock Producers Association Annual Report, 1924 (*Natl. Livestock Prod. Assoc. Ann. Rpt. 1924, pp. 108, figs. 18*).—An analysis of the business of terminal agencies of this association is submitted for 1924, with comparisons with the previous year.

Why has agricultural cooperation failed? L. F. EASTERBROOK (*Nineteenth Century, 98 (1925), No. 583, pp. 335–345*).—The author explains the apparent failure of agricultural cooperation in England by contrasting the needs of English and Danish farming and points out a lack of efficiency among British farmers as regards financial matters and various forms of cooperative effort.

Interim report on rates of freight on Canadian flour in the North Atlantic, H. J. MACKINDER ET AL. (*London: Imp. Shipping Com., 1924, pp. 16*).—This interim report of the Imperial Shipping Committee brings out the fact that a certain discrimination arose in 1922 in New York and elsewhere in the

United States against Canadian flour as compared with American flour, although shipped from the same ports. It was incidentally removed in the following year, and assurances have been given that there will be no recurrence.

Markets for agricultural implements and farm machinery in Argentina and Uruguay, S. H. Avery (*U. S. Dept. Com., Bur. Foreign and Dom. Com., Trade Inform. Bul. 366 (1925), pp. II+78*).—This publication offers a general survey of important crops grown and the implements used and sold, together with trade practices followed and suggestions for supplying the market.

The statistical determination of demand curves, H. Working (*Quart. Jour. Econ., 39 (1925), No. 4, pp. 503–543, figs. 9*).—This article is a consideration of the theoretical significance of representative statistical studies of demand. The procedure in obtaining data for the consumption of potatoes within a given period in successive years and prices on a specific market is outlined. These data are taken as the basis for determining the relation between production and final consumption, and from them statistical demand curves are derived. Another study of the relation between the total production of corn in the United States and the December price, which takes into consideration dealers' or speculators' demand, is also analyzed in this connection. The use of such price studies as a basis for price forecasting, the relation between theoretical and empirical demand curves, divergent statistical results which may be obtained, and the determination of the true relationship are analyzed. An extensive bibliography of price studies has been drawn up, annotated to indicate the principal variables studied and the statistical methods employed.

Report on problems of agricultural development in California, H. F. Ormsby and W. L. Connolly (*San Francisco: Calif. Devlpmt. Assoc., Dept. Research and Inform., 1924, pp. 21, figs. 6*).—This study was conducted by the research and information department of the California Development Association in an effort to correlate the problems of development, crop production, and marketing in the State. The extension of irrigation, colonization of farm lands, and financing development are discussed here, and the production, marketing, and financing of crops are set forth. Certain price relationships between California agricultural products and wholesale and nonagricultural commodity price levels are brought out.

Some aspects of the agrarian question in Mexico, H. Phipps (*Tex. Univ. Bul. 2515 (1925), pp. 157*).—This historical survey is presented in chapters on land tenure previous to the conquest, land tenure in the colonial period, ecclesiastical revenues and property in the colonial period, early attempts at reform, the reform, public lands and colonization, the agrarian situation under Diaz, and the agrarian phase of the revolution of 1910–1920.

The evolution of agriculture in the Vexin-Normand through a half century, G. de Bueil (*L'Évolution de l'Agriculture dans le Vexin Normand depuis un Demi-Siècle. Évreux: Impr. de l'Eure, 1924, pp. [4]+75, pls. 4*).—This is a historical and descriptive study of the agriculture of a region west of Rouen, France.

Jewish agricultural settlements in the Soviet Union (*Russ. Rev., 3 (1925), No. 19, pp. 399, 400*).—A brief note describes some Jewish collective farming projects.

The Punjab peasant in prosperity and debt, M. L. Darling (*London, New York, and Bombay: Humphrey Milford, Oxford Univ. Press, 1925, pp. XXIV+298, pls. 9*).—The author designates this as primarily a study of agricultural debt in the Punjab. In successive chapters attention is directed to agricultural and economic conditions in four submontane districts; the central, the north, the south, and the western Punjab; and the canal colonies. The rise

in the standard of living, the indications of agricultural progress, and the money-lending system are discussed in detail. The Punjab is said to be agriculturally the most prosperous province in India and probably also the most indebted. The author holds that prosperity has been too easily won, and urges education and cooperation.

Report by a tariff commission and by a commercial convention examining a bill concerning the wheat tariff, J. BERNIER (*Rapport Fait au Nom de la Commission des Douanes et des Conventions Commerciales Chargée d'Examiner le Projet de Loi portant Suppression du Coefficient de Majoration des Droits de Douane sur les Blés. Paris: Chambre des Députés, 1924, pp. 102, pl. 1*).—This report comprises an analysis of wheat export regulations in France since about the middle of the eighteenth century, a study of the wheat price crises of 1891, 1898, and 1912, and a review of the situation during the war and postwar periods. It is concluded that the protective régime instituted before the war has affected favorably wheat production in France, and its continuance is urged. It includes a review of statistics of wheat production in France and other principal wheat-producing countries, as well as of wheat prices and wheat consumption.

Developments in the wheat situation, April to July, 1925, J. S. DAVIS, K. SNODGRASS, ET AL. (*Food Research Inst. [Stanford Univ.] Wheat Studies, 1 (1925), No. 10, pp. 329–362, figs. 7*).—Changing prospects for the new crops of wheat and rye, considerable instability of wheat prices, unusually low export shipments, and greater than the usual seasonal declines in visible supplies are held to be features of the world wheat situation for this period.

The movement of agricultural products and the cost of living with respect to food commodities in Brazil, 1921–1923 (*Circulação dos Productos Agricolas e Custo da Vida, em Relação aos Artigos de Alimentação, no Brasil. Rio de Janeiro: Min. Agr., Indus. e Com., Serv. Insp. e Fomento Agr., 1925, pp. 521, pls. 2*).—This report from the Ministry of Agriculture, Industry, and Commerce presents miscellaneous statistics of the movement and prices of food products in Brazil for the period 1921–1923, with comparisons, and detailed reports by States, showing similar data and the principal exports from each.

Home work and agriculture [trans. title], L. RÖDER (*Heimarbeit und Landwirtschaft. Jena: Gustav Fischer, 1925, pp. VIII+64*).—The advantages and disadvantages of combining home industries or manufactures and agriculture are discussed from the points of view both of the agricultural industry itself and of other businesses and with reference to the standards of living of the rural population. An extensive bibliography is included.

Rural population groups, E. L. MORGAN and O. HOWELLS (*Missouri Sta. Research Bul. 74 (1925), pp. 5–68, figs. 11*).—Boone County was chosen for this study as being rather typical of a large part of rural Missouri, and 59 primary population groups (neighborhoods) and 15 secondary groups (communities) were identified. Names for primary groups were found to have been derived from the names of individuals, schools, churches, population centers, geographic phenomena, and miscellaneous sources. The intensity of primary group consciousness showed a consistent variation between high and low minus, 25 of these groups having a rating of medium, 10 each that of medium plus and low, and 7 each that of high and low minus. It was highest in those neighborhoods which were some distance from a community center and in those in which the opportunities for social contacts were greatest. The school was found to be the strongest factor in the maintenance of primary group consciousness. Intergroup consciousness was developed best through the consolidated high school and next by the church, the lodge, and the

store. The neighborhood was found to be losing, as a result of conflicting group loyalties, much of the force it once had in favor of the larger community which usually includes a town or village. This larger rural grouping is thought to have less vitality and intensity of group consciousness than the neighborhood, although it is gaining in this respect. The future of most community centers depends upon their ability to render superior service to the adjacent farm population. Negro primary groups were found to be gradually becoming less intense in their social solidarity as a result of the competition of the larger community center.

A social survey of Escalante, Utah, L. NELSON (*Brigham Young Univ. Studies No. 1 (1925), pp. 44, figs. 10*).—The history and physical layout of a typical Mormon agricultural village are described here. The crops and livestock produced, the size of holdings, and circumstances of tenure are noted, and consideration is given to the social relationships, such as age and occupation of the population, living conditions, and the size of families, and community institutions and organizations. Some of the significant aspects of the findings are appraised.

Country life in south China: The sociology of familism.—I, Phenix Village, Kwantung, China, D. H. KULP II (*New York: Teachers Col., Columbia Univ., 1925, vol. 1, pp. XXXI+367, pls. 10, figs. [16]*).—This is a sociological and anthropometric study of Phenix Village, situated near Chaochowfu in south China. The field study was made by the author, assisted by a native investigator in the summers of 1918 and 1919.

This village is organized upon the basis of the social system described as familism. Data were obtained as to schools, housing, customs, social organization, and geographical conditions, as well as to income, the manner of conducting business, and other aspects of village life. The questions asked were arranged under the following topics: The geographical situation, economic phenomena, ethnic relationships, biological data, political organization, social organization, cultural aspects of village life, social pathology, and religions.

Social aspects of farmers' cooperative marketing, B. Y. LANDIS (*Chicago: Univ. Chicago Press, 1925, pp. VI+62*).—This is Bulletin 4 of the department of research and education of the Federal Council of the Churches of Christ in America, New York. An inquiry was carried on to determine the evidences, if any, of noncommercial efforts or contributions along social lines for which typical farmers' cooperative marketing associations are responsible, what factors and conditions in typical farmers' cooperative marketing organizations or in local communities hinder or prevent such social results, and the relations between social, educational, and religious organizations and these cooperative economic organizations among farmers.

Data received from the managers of 1,052 grain, livestock, truck, fruit, dairy, and other local associations in all States of the country reveal that 617, or 58.6 per cent, profess to carry on no social or educational activities of any kind or to make any contributions in money to noncommercial organizations in their communities or neighborhoods. Replying to questions as to social and educational activities, managers of 1 association out of 10 reported the conduct of at least one recreational event. Ten of 120 of these replies noted that 12 or more such affairs had been conducted. A further 10.8 per cent of the returns received indicated that the associations held gatherings or events for the entire families of members during 1923, and 210 associations, or one-fifth of the total, reported making money contributions to noncommercial organizations.

Examples are cited of social and educational work carried on by local groups. The appendix gives summaries of studies of the social aspects of agricultural cooperatives in Europe.

Religion in country life: Proceedings of the Seventh National Country Life Conference (*Natl. Country Life Conf. Proc., 7 (1924), pp. IX+216, pl. 1, fig. 1*).—The addresses presented before this conference, held at Columbus, Ohio, in 1924, were A Challenge to the Christian Farmer, by K. L. Butterfield; Religion and Rural Culture, by E. C. Lindeman; What's the Matter with the Rural Church? by W. Burr; The Next Decade in Rural Church Progress, by E. de S. Brunner; and A Rural Religious Program as Viewed by a Catholic, by E. V. O'Hara. The discussions in the sessions centered around an analysis of the rural situation in the country, proposals for meeting this situation, suggested changes in the religious program in the country, and ways and means of improving religious life in the country. Stenographic reports of these discussions and reports of committees comprise the main part of the proceedings.

Empty churches: The rural-urban dilemma, C. J. GALPIN (*New York and London: Century Co., 1925, pp. X+150*).—The author in this essay on the rural church problem sets forth the extent to which churches in rural districts are being deserted, the lack of religious education for rural young people, the problems associated with the shifting tenant factor in the rural population, and the tendency of rural pastors to establish themselves in the city as soon as possible. In conclusion he points out examples of a new type of community church which is attempting to meet some of the rural problems.

A Christian in the countryside, R. A. FELTON (*New York: Methodist Book Concern, 1925, pp. 134*).—This one of a series of elective study courses for adult classes in rural Sunday schools sets forth the application of Christian ideals and principles to present-day problems of living in rural communities, the lessons being based upon Bible readings.

Play in rural life, W. A. ANDERSON (*Social Forces, 4 (1925), No. 1, pp. 113–117*).—Play and recreation are regarded as important socializing factors in rural life.

Thomas Dekker: A study in economic and social backgrounds, K. L. GREGG (*Wash. [State] Univ. Pubs., Lang. and Lit., 2 (1924), No. 2, pp. 55–112*).—Chapters 3 and 4 of this interpretation of the plays and other writings of an Elizabethan of the middle class are devoted to a discussion of his references to the social unrest, poverty, and vagabondage, which resulted from inclosures throughout England and the eviction of tenants and others from their rural holdings.

The organisation of international statistics based on the results of researches carried out with the assistance of agricultural book-keeping, E. LAUR (*Internatl. Rev. Sci. and Pract. Agr. [Rome], n. ser., 2 (1924), No. 3, pp. 589–593*).—A scheme for analyzing the results of statistical research based on farmers' account books includes 14 groups of farms classified on the basis of the type of livestock or crops produced. Each one of these may be further subdivided into five size groups.

An agricultural census, R. J. THOMPSON (*Jour. Roy. Statis. Soc., n. ser., 88 (1925), No. 2, pp. 185–220*).—The methods of collecting agricultural statistics and miscellaneous related items in England and Wales are set forth in detail. The taking of the decennial agricultural census and the making of crop estimates in the United States and the collection of statistical information in Canada and South Africa are noted.

International yearbook of agricultural statistics for 1924–25 (*Inst. Internatl. Agr. [Rome], Ann. Internatl. Statis. Agr. (Internatl. Yearbook Agr. Statis.), 1924–25, pp. XCII+489*).—This one of a series previously noted (E. S. R., 52, p. 792) presents data for 1924, with some for 1925, and includes supplementary information for earlier years which was not available at the time of issuing the earlier report.

World production of and trade in grain [trans. title], C. DRAGONI (*Italia Agr., 62 (1925), No. 9, pp. 442–451*).—Statistics for 1921 to 1924, inclusive, are presented, with comparisons with the pre-war average, showing production and imports and exports of grain by the principal countries.

Agricultural statistics [for Scotland], 1924, J. M. RAMSAY (*Scot. Agr. Statis., 13 (1925), Nos. 1, pp. 47; 2, pp. 49–71; 3, pp. 73–98*).—This annual report in three parts gives statistics of acreage, returns, and prices superseding those previously noted (E. S. R., 53, p. 94).

AGRICULTURAL AND HOME ECONOMICS EDUCATION

Farm crops, P. W. CHAPMAN, C. W. EDGERTON, J. G. LEE, JR., L. M. SHEFFER, and R. H. THOMAS (*Atlanta, Ga.: Turner E. Smith Co., 1925, pp. X+550, pl. 1, figs. 195*).—The plan of organization and selection of the teaching material are thought to be adaptable to the job analysis method of teaching. The managerial aspect of crop production is emphasized, giving particular attention to soil improvement crops. The exercises and teaching devices involved include farm and field studies, farm practice, demonstrations, science exercises, readings, supervised study, and recitations.

Live stock and poultry, D. S. LANCASTER, F. W. FITCH, R. C. MILLER, D. W. WILLIAMS, L. M. SHEFFER, and B. F. KAUPP (*Atlanta, Ga.: Turner E. Smith Co., 1925, pp. VIII+564, pl. 1, figs. 249*).—Hog, dairy cattle, sheep, beef cattle, work stock, and poultry enterprises have been analyzed after a plan by Schopmeyer and Williams noted earlier (E. S. R., 53, p. 495), and the teaching material presented here for each has been developed from that analysis. The work was done by specialists located in southern States. The volume is designed primarily for use as a textbook in vocational agricultural classes in high schools.

Marketing, E. BROWN (*New York and London: Harper & Bros., 1925, pp. X+503, pls. 4, figs. 2*).—Special emphasis is given to the examination of actual practice in certain basic trades, including wheat, cotton, livestock and meat, fresh fruits and vegetables, coffee, tobacco, and others. The subject matter is not, however, divided into the marketing of farm products and raw materials and that of manufactured products, but is arranged to show the interrelations between the markets for these two groups. Organized exchanges and future trading and wholesale and retail distribution are described, and generalizations or principles of marketing are arrived at inductively. The major problems of marketing policy are discussed, mainly from the standpoint of the selling of manufactured goods.

How to know laces, E. H. ROBERTS (*New York: Dry Goods Econ., 1925, pp. VIII+67, figs. 36*).—A brief history is given of the various types and kinds of laces, with descriptions of differences in their design and manufacture. A postscript on embroideries and a list of definitions of lace terms are added.

Methods and results of cooperative extension work, H. W. GILBERTSON and C. L. CHAMBERS (*U. S. Dept. Agr., Dept. Circ. 347 (1925), pp. 38, figs. 7*).—The work of the county agricultural agents in 1923 is reported upon under the general heads of status and outstanding developments, supervision, program of work, projects, means and methods used in advancing extension work, and measuring progress.

FOODS—HUMAN NUTRITION

800 proved pecan recipes: Their place in the menu (*Manheim, Pa.: Keystone Pecan Research Lab., 1925, pp. XIV+392, pls. 32*).—This collection of pecan recipes has been compiled from a very much larger number of recipes

from various sources, and includes recipes for pecan yeast breads, quick breads, cakes, candies, desserts, entrées, pies and pastries, salads, sandwiches and relishes, and miscellaneous foods. Brief chapters on food values, the nutritive value of pecans, and classes of flour, and sample menus embodying some of the recipes are included.

Basal metabolism of children, F. B. TALBOT (*Physiol. Rev., 5 (1925), No. 4, pp. 477–517, figs. 6*).—In this comprehensive review of the literature on the subject, the author first discusses factors complicating basal metabolism data of early childhood, including the influence of food and of sleep and the changes due to growth and development. The literature on basal metabolism of normal children is then reviewed, with selected data from published and unpublished work of the author and his associates. A final section is devoted to basal metabolism in abnormal conditions and disease. A bibliography of 169 titles is appended.

The development and diet of Chinese children, J. HAMMOND and H. SHENG (*Amer. Jour. Diseases Children, 29 (1925), No. 6, pp. 729–742, figs. 8*).—This study, which is reported from the pediatric clinic of the department of medicine, Peking Union Medical College, China, was undertaken to aid in determining the normal growth standards of the Chinese child and the factors, particularly food, of influence in the development of these standards. The data reported include physical measurements of 96 Chinese boys living in the School for Poor Children in the north of Peking and of children of the middle class in various summer schools in Peking, and records of the food consumption for the entire day of 6 children each from the first group of the ages 8, 12, and 16 years. The figures for 3 children in each group represented the actual food intake for the entire day and for the other 3 the combined food intake for the entire day of a different child for each of the three meals.

The diet of the 8-year-old group furnished about 900 calories daily and of the 12- and 16-year-old groups 1,000 and 1,700 calories, respectively. The average distribution of the calories for the three groups was fat from 13 to 14, 12 to 13, and 8 to 9 per cent, carbohydrate from 74 to 75, 75 to 76, and 78 per cent, and protein from 11 to 12, about 12, and from 12 to 13 per cent, respectively. In comparing these values with European and American standards, it is thought that a year and a half should be subtracted from each age to make allowance for the Chinese custom of calling a child a year old at birth and dating the following birthdays from the Chinese new year. With this allowance, the caloric intake of these Chinese children was only about one-half that of American children of the same age, the number of calories per kilogram slightly over one-half, the protein and fat intake low, and the carbohydrate intake high. The diet was a monotonous one, consisting of wheat or corn meal mantons (steamed bread), corn meal or millet gruel, vegetables cooked with oil or a little pork, and salt vegetables. No milk, butter, eggs, and practically no fruit were used.

The physical measurements were compared with the Baldwin and Holt standards for American boys of the same age. In standing height and weight for age and in weight for height, the measurements of the two groups of Chinese children corresponded closely and were below the American standards. In sitting height the curves for the poor children were distinctly below the other group of Chinese children and the American standards.

In commenting upon these results, the fact that the Chinese children were well and in active physical condition on diets considerably lower than the American standards is thought to indicate a real difference between the Chinese "normal" and the American "normal."

The origin and destiny of cholesterol in the animal organism.—Part XIV, The cholesterol metabolism in normal breast-fed infants, F. W. Fox and J. A. Gardner (*Roy. Soc. [London] Proc., Ser. B, 98 (1925), No. B 687, pp. 76–92*).—Determinations of the cholesterol balance in healthy breast-fed babies from 1 week to 10 months of age are reported and compared with similar data from the literature.

The data indicate that during the first few days of life the output of sterols is larger than the intake, in the next two weeks there is practically a balance between intake and output, and after this the balance is decidedly positive. The authors conclude that there must be some organ in the body capable of synthesizing cholesterol, but that the sterols in the diet form a source of supply which can not be disregarded.

Metabolism in pregnancy, V. J. Harding (*Physiol. Rev., 5 (1925), No. 3, pp. 279–302, figs. 2*).—A review of the literature on the subject, with a bibliography of 149 titles.

Muscular exercise, lactic acid, and the supply and utilization of oxygen.—Part IX, Muscular activity and carbohydrate metabolism in the normal individual, K. Furusawa (*Roy. Soc. [London] Proc., Ser. B, 98 (1925), No. B 687, pp. 65–76, figs. 2*).—In this investigation the conclusions drawn by Krogh and Lindhard (E. S. R., 44, p. 463), in a study of the same question by determinations of the respiratory quotient during exercise, were confirmed by following the gaseous exchanges during not only exercise but also recovery. Two subjects experienced in the use of the Douglas bag took part in the study, which included observations when on a normal diet and on a high fat diet of short and longer periods of exercise and recovery. The principal results and conclusions are summarized as follows:

"On a normal diet, the average value of the respiratory quotient of the excess metabolism due to a short element of exercise is 1.01; i. e., carbohydrate only is responsible for the process of contraction and recovery from it. As the duration of exercise is prolonged the respiratory quotient of the excess metabolism falls slowly, and indicates that some substance other than carbohydrate is being called upon.

"On a fatty diet, it is shown that even when the basal respiratory quotient reaches 0.71, short-lived muscular exercise is performed at the expense only of carbohydrate, as on the normal diet. In long-continued exercise, however, fat takes part more quickly than on the normal diet. From these facts we can conclude that in exercise of short duration, in which no change in the general metabolism of the body as a whole might be expected, the human body acts as though it were an isolated muscle, in which carbohydrate is the only substance oxidized, as shown by Meyerhof. The primary fuel of contraction, therefore, in the human muscle is carbohydrate, and fat or protein is presumably used to replenish the carbohydrate store which has disappeared."

The metabolism of sulfur.—IX, The effect of repeated administration of small amounts of cystine, H. B. Lewis (*Jour. Biol. Chem., 65 (1925), No. 1, pp. 187–195*).—Continuing the serious previously noted (E. S. R., 51, p. 863), the author, with the cooperation of H. Updegraff, has studied the changes in the blood and urine of rabbits following the feeding of cystine in small doses, from 0.5 to 1 gm. per kilogram of body weight, on successive days instead of in a large single dose as in some of the earlier studies.

The cystine was administered orally as the sodium salt both to fasting rabbits and to rabbits on a diet of oats and cabbage. The urine was examined before and during the experiment for the presence of protein and casts, and determinations were made of the total nitrogen, creatinine, and amino nitrogen, and in some cases of cystine, total sulfur, total sulfate sulfur, and neutral sulfur.

Following the ingestion of cystine, protein and casts appeared in the urine and there was a decrease in the excretion of nonprotein nitrogen and creatinine but no marked loss in cystine. The neutral sulfur fraction of the urine was increased, but this rise is considered to be due not to the presence of cystine but of a sulfur-containing substance intermediary between cystine and inorganic sulfates.

Iron in nutrition.—I, Nutritional anemia on whole milk diets and the utilization of inorganic iron in hemoglobin building, E. B. HART, H. STEENBOCK, C. A. ELVEHJEM, and J. WADDELL (*Jour. Biol. Chem., 65 (1925), No. 1, pp. 67–80*).—In the introduction to this paper the pioneer work of Von Bunge and of Abderhalden on the deficiency of iron in milk and the failure of inorganic iron to supplement this deficiency with respect to the formation of hemoglobin in the blood is reviewed, and attention is called to the fact that these observations have not been taken into consideration in the interpretation of the results of recent investigations by Mattill and coworkers (E. S. R., 52, p. 864), Anderegg and Nelson (E. S. R., 53, p. 866), and Sure (E. S. R., 51, p. 563) on the nutritive properties of milk with special reference to reproduction. Raising the question as to whether normal reproduction could be expected from animals suffering from anemia, the authors have undertaken a reinvestigation of the availability of inorganic iron as compared with organically combined iron for hemoglobin building and of the rôle in this connection of such a complex compound as chlorophyll, which is free from iron. In the present paper data are presented on the effect upon the hemoglobin and erythrocyte contents of the blood of rabbits on a diet of whole milk and sodium citrate, of the addition of inorganic iron in the form of iron oxide, Fe_2O_3, of fresh cabbage, and of iron oxide plus fresh cabbage, the alcoholic extract of dried cabbage, the alcoholic extract of yellow corn meal, and chlorophyll.

On a sole diet of milk, with sufficient sodium citrate to prevent the formation of hard curds, the animals invariably came down with anemia. On milk supplemented with cabbage at a level of 50 gm. daily some but not all of the animals escaped anemia or were very slow in coming down with it. The addition of 0.015 gm. of iron oxide did not prevent the onset of anemia, but delayed it to some extent, while the addition of both cabbage and iron oxide invariably prevented it. Similar positive results in the presence of iron oxide were obtained with cabbage dried at 65° C. for 24 hours, alcoholic extracts of desiccated cabbage and corn meal (both entirely free of iron), and chlorophyll.

In endeavoring to explain these results, vitamins A, B, C, and D (antirachitic) are ruled out by experimental evidence. With regard to vitamin E (reproductive), conclusive evidence has not yet been obtained. "Should further investigations absolutely exclude vitamin E as a factor concerned in hematin building, then it appears probable that in addition to the protein mixture of milk and the known vitamins there must occur, preformed in the diet, certain complexes needed for hematin formation."

The effects of radiation on calcium and phosphorus, H. S. MAYERSON, L. GUNTHER, and H. LAURENS (*Soc. Expt. Biol. and Med. Proc., 22 (1925), pp. 469, 470*).—Determinations of the content of calcium and phosphorus in the blood of normal dogs on a well-balanced diet before and after irradiation with a 25-ampere flaming arc at 40 cm. for 1 hour daily for 8 days showed a marked increase in the phosphorus and decrease in the calcium content of the blood during the irradiation, and a return to normal values soon after the treatment was stopped. On repeated exposures of the same duration, the rise in phosphorus was accompanied by a rise in calcium. Irradiation for 2 hours daily for 8 days gave results similar to those obtained with repeated exposures. The excretion of both calcium and phosphorus in the urine as

compared with the feces was high following irradiation, indicating increased absorption and retention.

Attention is called to similar results reported by Orr et al. in a study of the effect of irradiation on the calcium and phosphorus metabolism of rachitic infants (E. S. R., 50, p. 669), and it is pointed out that the present results are of significance on account of their being obtained on normal animals on complete diets and of thus suggesting the possibility of stimulating the balances already positive to optimum by irradiation.

The practice of artificial light-bath treatment, J. H. SEQUEIRA and W. J. O'DONOVAN (*Lancet [London], 1925, I, No. 18, pp. 909–912*).—This is a brief discussion of heliotherapy by artificial light, including a summary of the therapeutic activity of different parts of the solar spectrum, a description of various lamps for therapeutic use with directions for clinical dosage, a summary of the physiological effects of exposure, and suggestions as to the management of a light treatment clinic. In the authors' experience, exposure to light baths brings about no change in basal metabolism, body temperature, pulse rate, respiration, and blood pressure, no material alteration in the blood count but in some cases a slight increase in leucocytes, and an increase in growth and body weight if below normal at the beginning of the experiment.

The epithelial tissues in experimental xerophthalmia, S. B. WOLBACH and P. R. HOWE (*Soc. Expt. Biol. and Med. Proc., 22 (1925), pp. 402, 403*).—It is reported that rats which have died or have been killed in advanced stages of xerophthalmia as a result of a deficiency in vitamin A show a number of gross pathological changes in addition to those of the eye. These include the presence of abscess-like cavities filled with a yellow cheesy-like material at the base of the tongue, in the pharynx, and in the submaxillary glands. In the males the prostate glands and the seminal vesicles are often shrunken and filled with similar yellowish spots. Microscopical examination has shown that the cavities are cysts lined with a stratified keratinizing epithelium, and the cheesy mass a mixture of desquamated keratinized cells and leucocytes.

Microscopic study of the lesions in rats killed at progressive stages of xerophthalmia has shown that the principal change is "transformation of various epithelia into a stratified squamous keratinizing epithelium. This change is practically constant in the upper respiratory tract, including the whole of the nasal passages, larynx, trachea, and bronchi. In the digestive tract, the stomach and intestines have so far exhibited no change, but all the salivary glands and the accessory salivary glands are affected, and frequently show cavities resulting from the retention of desquamated keratinized epithelial cells. Similar changes occur late in the pancreas. In the genitourinary tract, this transformation into keratinized epithelium is found in the renal pelvis, bladder, seminal vesicles, epididymis, and prostate gland. In all of the glands noted above there is a considerable degree of atrophy before the change in character of the epithelium takes place. Other changes observed include a striking atrophy of the thyroid gland, testes, and paraocular glands."

The effect of the scorbutic state upon the production and maintenance of intercellular substances, S. B. WOLBACH and P. R. HOWE (*Soc. Expt. Biol. and Med. Proc., 22 (1925), pp. 400–402*).—A brief report is given of a study of the effect of a lack of vitamin C on the incisor teeth of growing guinea pigs and on the repair of experimentally made bone lesions and of the response to the addition of orange juice to the scorbutic diet.

In the teeth the earliest changes were observed in from 6 to 7 days. The most striking of these changes are described as the separation of the layer of odontoblasts from the dentine, with the filling in of the space between them with a liquid. The odontoblasts themselves undergo changes in size,

arrangement, and staining reaction. Within 48 hours after the administration of an antiscorbutic there is a prompt formation of dentine, filling in the space caused by the separation of odontoblasts. In the bones the changes noted are cessation of bone formation, with accumulation of osteoblasts in certain localities, particularly under the periosteum. A single dose of orange juice or other antiscorbutic substance is followed by prompt appearance of bone matrix between the cells. Artificial bone lesions show no repair until the addition of antiscorbutic substances, when there is a prompt formation of new bone.

"The scorbutic state may be characterized as one affecting supporting tissues in which the cells are unable to produce and maintain intercellular substances. This condition affects various supporting substances to a different degree, and is most marked in those in which the intercellular substance is calcified, as the dentine of teeth and the matrix of bone. The characterization applies to cartilage and connective tissue, and, by inference, to other intercellular substances, including that of blood vessels. The hypothesis is entertained, based upon the study of repair in incisor teeth of scorbutic guinea pigs, that in the formation of intercellular substances there is a change of the material from a liquid to a solid or jell state, and that the missing factor in the scorbutic condition is one affecting the jelling or setting of a liquid product."

Studies on experimental rickets.—XXVI, A diet composed principally of purified foodstuffs for use with the "line test" for vitamin D studies, E. V. McCollum, N. Simmonds, J. E. Becker, and P. G. Shipley (*Jour. Biol. Chem., 65 (1925), No. 1, pp. 97–100*).—In this continuation of the studies on experimental rickets previously noted (E. S. R., 51, p. 567), attention is called to complications which have been found to arise in the use of the antirachitic diet described in connection with the line test for calcium deposition (E. S. R., 47, p. 566). This diet includes 33 per cent of wheat, and it has been found that if hard wheat is used in place of soft wheat, the excess of phosphorus in the former as compared with the latter is sometimes sufficient to prevent the production of a sufficiently severe form of rickets in rats to allow them to be used for the line test. To obviate this difficulty two new diet formulas have been developed which are said to produce an exaggerated form of rickets. These are as follows: Diet 4025, wheat germ 5, salt mixture 37 5.15, calcium carbonate 1.5, gelatin 10, egg albumin 10, wheat gluten 12, agar-agar 2, dextrin 49.35, and butterfat 5 gm.; diet 4026, wheat germ 5, salt mixture 38 4.3, calcium carbonate 1.5, casein 20, gelatin 5, wheat gluten 5, agar-agar 2, dextrin 52.2, and butterfat 5. Salt mixture 37 consists of $CaCO_3$ 1.5, KCl 1, NaCl 1, $NaHCO_3$ 0.40, MgO 0.20, $FeSO_4+7H_2O$ 0.20, and KH_2PO_4 0.85 gm. Salt mixture 38 is the same as 37 with the omission of KH_2PO_4. The substitution of an equivalent amount of yeast for the wheat germ in the second formula can be made without altering the results, but if this is done in the first the young animals are not ready to use for the test for about 35 or 40 days as compared with 25 days for the other diets.

Goiter incidence in school girls of New York City, I. H. Goldberger and A. K. Aldinger (*Amer. Jour. Diseases Children, 29 (1925), No. 6, pp. 780–798, figs. 3*).—The goiter survey reported in this paper is of interest as having been conducted in a geographically nongoitrous region as compared with most of the surveys recently reported, which have been in goitrous localities. The report is prefaced by a summary of previous surveys reported in the literature and a brief discussion of the etiology of simple goiter. The present survey was conducted on 11,084 girls from various public schools in Manhattan and the Bronx, including several young women graduates of various high and private schools who were entering the junior year of the New York Training

Theory and science in mercerizing, C. F. GOLDTHWAITE (*Textile World, 65 (1924), No. 5, pp. 217, 218, 276, figs. 4*).—A review is given of recent investigations designed to explain what takes place in each step in the process of mercerization of cotton.

Impregnation of cotton yarns and fabrics with rubber latex, J. J. SCHILTUIS (*Leipzig. Monatsschr. Textil Indus., 40 (1925), pp. 268–270; abs. in Jour. Textile Inst., 16 (1925), No. 10, p. A314*).—In investigations on the best methods for applying rubber in the form of latex to textiles, preliminary steeping in an alkaline bath followed by washing was found to greatly improve the succeeding impregnation. Breaking strength and stretch were not affected by the treatment with latex to any noticeable extent. The resistance to fatigue and repeated stresses was increased, and the permeability to water was decreased.

Methods of examination of mildewed cotton material, T. B. BRIGHT (*Jour. Roy. Micros. Soc., 1925, No. 2, pp. 141–144, pls. 2*).—The methods outlined for the microscopic detection of mildew in cotton cloth were developed at the Shirley Institute.

The strength characteristics of jute [trans. title], H. SOMMER (*Leipzig. Monatsschr. Textil Indus., 39 (1924), pp. 379–383; abs. in Melliand's Textilber., 6 (1925), No. 4, p. 274*).—In investigations of the discrepancies encountered in the strength of jute fiber of different spun lengths, the elementary fiber showed about twice the strength of comparable spun lengths. The differences seemed due to the fact that in the first case only the elementary fiber was tested, while in the second case the fiber bundles held together by intercellular binding material were torn asunder and torn irregularly. Differences were also noted between the head and root ends and the middle section of the stalk.

During the spinning process the jute fiber lost about 10 per cent in strength. In regard to its sensitivity to light, with illumination of from 1 to 12 hours' duration jute fiber turned yellow and lost from about 13.5 to 50 per cent in strength. A number of tests were also made on jute yarn.

Classification of raw silk, W. P. SEEM (*Textile World, 65 (1924), No. 25, pp. 65, 67, 69, 109*).—The economic reasons for a universal standard for raw silk are set forth, and methods of testing raw silk for quality are described briefly with comment on defects.

Cohesion in raw silk, W. P. SEEM (*Textile World, 65 (1924), No. 3, pp. 65, 67*).—The quality in raw silk known as cohesion is defined, and its direct relation to physical qualities is indicated. The author briefly discusses the value of friction and cohesion tests.

Tin-weighting skein silk and piece goods, H. R. TISDALE (*Textile World, 65 (1924), No. 26, pp. 33, 34*).—An outline of the process of weighting silk fiber with tin.

Quality tests of real and artificial silks, W. F. EDWARDS (*Textile World, 65 (1924), No. 12, pp. 55, 57, 107, figs. 4*).—The importance of the serigraph tests showing stress-strain relations for silk and artificial silk is indicated in a discussion of its application.

An interesting inflammability test (*Amer. Silk Jour., 44 (1925), No. 9, pp. 53, 54, figs. 7*).—Exposure of fabrics made of rayon, cotton, silk, and of combinations of these fibers to intense electric-ray heat for a definite time (2 minutes) showed that rayon is not to be considered more inflammable than similar fabrics of cotton, linen, or jute when exposed to conditions causing fire. In certain cases, cotton alone ignites more readily and is more completely consumed than rayon alone.

Moisture in artificial silk, G. BARONI (*Textile World, 65 (1924), No. 10, p. 35*).—Studies on several samples of rayon of known origin showed that

Chardonnet is more hygroscopic than cuprammonium or viscose silk. The latter were similar in this respect.

Causes of damages in crêpe fabrics, J. Chittick (*Textile World, 65 (1924), No. 15, pp. 121, 123*).—Imperfections peculiar to crêpe construction are described, with discussion of the characteristics of damage resulting from incorrect yarn sizes, variation of twist, and the methods followed in warp preparation, weaving, dyeing, and finishing. The author observes that piece-dyed fabrics are usually subject to more defects than yarn-dyed goods.

Stains on textiles (*Textile World, 65 (1924), No. 12, pp. 49, 51, 107*).—The stains most frequently encountered in mill practice and their causes are described.

HOME MANAGEMENT AND EQUIPMENT

An analysis of domestic metered water heating in California, R. C. Bragg et al. (*Jour. Elect., 54 (1925), No. 11, pp. 397, 398*).—From reports of 7,183 water heaters it was found that more than two-thirds were of the 4- or 5-kw. size. About 85 per cent of the heaters were used in conjunction with electric ranges and 15 per cent where no ranges were installed. Eighty-seven per cent of the heaters were of the circulation type, and 58 per cent were equipped with thermostats. The average consumption of the heaters supplying continuous automatic hot-water service was 574 kw. hours per month, or nearly three times the consumption of the heaters supplying intermittent hot-water service. All of the heaters were operating on standard cooking and heating schedules, most of which were designed to throw the water heating on the 2-ct. rate.

Where continuous hot-water service was maintained the load factor was controlled largely by the heater capacity. Large heaters had less favorable load factors and smaller heaters more favorable, while supplying the same service at the same kilowatt hour cost, since the amount of water heated determined the consumption.

It is concluded that electric water heating is a success on a meter rate of 2 cts. per kilowatt hour.

MISCELLANEOUS

Report [of Florida Station] for the fiscal year ending June 30, 1919, P. H. Rolfs et al. (*Florida Sta. Rpt. 1919, pp. 65+III*).—This contains the organization list, a financial statement for the fiscal year ended June 30, 1919, a list of the publications of the year, a general review of the work of the station during the year, and departmental reports, the experimental features of which are for the most part abstracted elsewhere in this issue.

Thirty-seventh Annual Report [of Tennessee Station], 1924 (*Tennessee Sta. Rpt. 1924, pp. 44, figs. 58*).—This contains the organization list, an illustrated account of the work of the station, and a financial statement for the fiscal year ended June 30, 1924. The experimental work reported is for the most part abstracted elsewhere in this issue.

Report of the Virgin Islands Agricultural Experiment Station, 1924, J. B. Thompson et al. (*Virgin Islands Sta. Rpt. 1924, pp. [2]+19, figs. 8*).—This includes the organization list and reports by the director, the horticulturist, and the agronomist as to the work of the station for the fiscal year ended June 30, 1924. The experimental work reported is for the most part abstracted elsewhere in this issue.

Summary of publications, B. C. Pittman (*Utah Sta. Circ. 56 (1925), pp. 4*).—This contains summaries of publications of the station issued since September, 1924, including abstracts of scientific and technical papers published outside the station series.

NOTES

Arkansas University and Station.—Construction of the new agricultural building is under way, and its occupancy is expected by January 1, 1927. A unit structure, three stories high and 256 ft. long, 58 ft. wide, and with L's extending back 88 and 116 ft., is to be erected. The building will provide accommodations for the dean, the agricultural editor, the agricultural library, a student room, a seed laboratory, and quarters for the departments of agronomy, horticulture, plant pathology, entomology, agricultural economics, aud rural sociology.

The cotton substation, for which $10,000 was appropriated by the 1925 legislature, has been located at Marianna, in Lee County, where a tract of 160 acres has been selected. E. B. Whitaker, district extension agent for southeastern Arkansas, has been appointed assistant director of the substation, beginning February 1.

Connecticut Storrs College and Station.—Ground has been broken for a new college dormitory to accommodate about 100 men.

A new research laboratory has been equipped for the department of animal diseases, providing the station with excellent facilities for bacteriological research.

Margaret Schneider, station statistician in poultry genetics, resigned November 1, 1925, to continue graduate work at Columbia University. George C. White has been appointed dean of the division of agriculture in the college, a position which has been vacant since the resignation of W. L. Slate, jr., about two years ago, to become director of the station. E. O. Anderson has been appointed in charge of dairy manufactures.

Florida University and Station.—Under a provision made by the last legislature, plans are being prepared for the erection of the first unit of a new agricultural building. This unit is to cost $125,000, and it is anticipated that its completion will relieve materially the present congested condition of the station building.

A new project recently started by the station is an investigation of Manson's eye worm, a serious disease of poultry found in various parts of Florida. This work is being conducted by Dr. D. A. Sanders, assistant veterinarian, who has temporarily transferred his headquarters from Gainesville to Bradenton. It is expected that several months will be required for the study, which it is hoped will include the life history of the pest and the devising of control measures.

Dr. Ouida Davis Abbott has been appointed to head the new department of home economics research of the station and has entered upon her duties. It is planned to establish immediately a well-equipped department for research upon various problems, including dietetics, food conservation, household management, and sanitation.

George D. Smith, associate entomologist in cotton insect investigations, has resigned to engage in commercial work and has been succeeded by Edgar F. Grossman, formerly with the Georgia State Board of Entomology. E. W. Cowan has been appointed assistant chemist, principally in connection with the cooperative fertilizer experiments under way in various sections of the State. Other appointments include Henry Zeigler as farm foreman at Gainesville, R. G. Hastings and D. G. A. Kelbert as field assistants in plant pathology, and Pence Peterson as station dairyman vice O. D. LaGrave, resigned.

EXPERIMENT STATION RECORD

VOL. 54 MARCH, 1926 No. 4

Another of the useful series of reports prepared each year by the Office of Experiment Stations on the work and expenditures of the experiment stations has recently become available. This report covers the fiscal year ended June 30, 1924, and summarizes for this period the progress of the stations as a whole. As usual it assembles in convenient form data otherwise considerably scattered, and discusses the work, the publications, and the outlook of these institutions as component parts of a national research system.

It appears that the financial resources of the State experiment stations for the year aggregated $10,034,074.56, an increase of more than $500,000 over the previous year. Less than 15 per cent of the total income was therefore derived from the Federal appropriations of $1,440,000 under the Hatch and Adams Acts, nearly 86 per cent being obtained from non-Federal sources and over 61 per cent directly from State appropriations. The year was noteworthy as the first in which every station received some State aid, although in the case of 6 stations the amount was below $10,000 each. On the other hand, for 11 stations this aid amounted to over $200,000 in each case, and for 9 others it exceeded $100,000 each.

The value of additions to the equipment of the stations during the year is reported as $2,013,785.98, of which $1,381,638.48 was in the form of new buildings. While a large part of the additions were along stereotyped lines, a growing recognition is noted of the need of special provision for investigations which require more exact control or measurement of environmental conditions and factors—temperature, moisture, light, and air—in the many research problems in which such control or measurement is a necessity. Fortunately, the tendency is more and more to make provision for this purpose in the original construction of laboratory buildings and plant houses rather than by means of special independent pieces of apparatus or supplementary equipment. However, a notable increase in special structures for small experimental animals is recorded—a necessary outgrowth of the great extension of the use of such animals for research, especially nutrition and animal diseases.

In the work of administration and inquiry a total of 2,385 persons were employed on a whole time or part time basis. Of these 1,158

were also members of the teaching staffs of the colleges and 566 assisted in various lines of extension work. A decrease in the annual overturn is noted, and it is believed that the difficulty of maintaining a competent personnel is being somewhat relieved. According to the report, "conditions for maintaining a more permanent research force have distinctly improved, and means of securing the advanced training required in research have increased. Graduate courses for investigators and agricultural specialists have increased, particularly in the larger institutions, and opportunities for graduate work for advanced degrees are being more freely provided. These conditions have placed a larger number of trained workers at the disposition of the stations, and the effect has been to raise the standards and the requirements for those engaged in leading lines of investigation."

Most of the work of the stations has now been placed on a definite project basis. The actual number of projects reported as active during the year, including 181 carried on by the Alaska and insular stations, was 5,293 as compared with 5,156 the previous year. Of these 54 were purely administrative, service, control, or regulatory.

The subject distribution of the 5,239 remaining projects differed little from that of 1923. Field crops led with 1,722 projects, followed in descending order by horticulture 919 projects, animal production (including poultry) 638, plant diseases 450, dairy cattle and dairying 301, soils 300, fertilizers 218, rural economics 209, veterinary science 193, agricultural engineering 138, genetics 102, and foods and human nutrition 49. There was an increase during the year of 111 projects under field crops, 25 under fertilizers, 24 under dairy cattle, and 23 under rural economics.

The total number of publications issued was 836, including annual reports, bulletins, circulars, and press bulletins aggregating 24,602 pages and distributed to 930,364 addresses on regular mailing lists alone. While the regular publications of the stations have not materially increased in number and volume in recent years, remaining at about 500 annually, the variety and extent of publication through other channels have vastly increased. This differentiation, however, it is made clear, should not be taken as indicating any lack of activity in that direction or of obligation to the public. "On the contrary, more attention than ever is paid to the proper publication of the station work, to publicity regarding its activities, and efforts to bring the practical results effectively before the farming people. This is believed to be in full accord with the spirit of the clause in the Hatch Act regarding publications. The only distinction is that avenues and agencies are now open for making the work of the stations known which were not in existence at the time the Hatch Act was passed, and this fact has led to a modification of practice the

better to suit current conditions." The net result is a distinct enlargement of published output, with a better adaptation of it to different classes of readers.

As a rule there has been decided improvement in appearance and subject matter of the station publications. The nature and purpose of the annual report required by the Hatch Act continues to be the subject of much discussion and diversity of practice. There appears, however, to be a tendency to reduce the report in size and make it primarily administrative. There is increasing acceptance of the view that the report is not an appropriate place for original accounts of scientific work but may properly be limited to a concise showing of the progress of the station and how it is discharging its obligations and serving the public.

Considerable diversity in practice as to the distribution of publications is reported. Some of the stations, in an attempt to guard against waste and to conserve their limited printing funds, have abandoned mailing lists except for libraries and workers in similar institutions, sending their publications only on individual requests in response to announcements through the press and by means of post cards. Other stations, however, that have tried this plan have returned to the practice of maintaining regular mailing lists corrected at frequent intervals and classified according to the different lines of interests.

Progress in the development and improvement of methods of administration of research and in coordination of effort is recorded in many cases. There is evidence of a growing appreciation of the need of closer administrative and staff contacts, and of the value of committee work and conferences. The increasing need for inspiring leadership to promote cooperation and teamwork accentuates the importance of close administrative attention to station affairs and is thought to argue strongly for the independent station director who can give his attention exclusively to station affairs. For the year under review there were found to be 20 States with separate directors, 18 in which the offices of dean of agriculture and director were combined, 3 in which there were combination directors of station and extension work, and 7 in which the station director was also dean of agriculture and director of extension. In some of these cases, however, the situation was considerably modified by the designation of vice directors.

In a discussion of recent trends in station work attention is directed specifically to the sharper differentiation of research, regulatory, and service lines, the adoption of more specific and fundamental projects evidencing a deeper scientific insight, and the improvement of methods, apparatus, and techniqne. It is pointed out

that about one-third of the stations, principally in the Eastern States, are still charged with regulatory or service duties of various kinds which lie outside of their primary functions as research institutions, but that in recent years there has been a relative decrease in the station participation in such work. State departments of agriculture and similar agencies have been encouraged to take over these duties and are doing so to an increasing extent.

In an effort to obtain more exact information on this point, a modification of the financial reports was made by the Office, which provides for a measure of differentiation of the amounts expended for research, maintenance of branch stations, surveys, conduct of farms and related commercial enterprises, and regulatory and service duties. The returns from this report, available for the first time, indicate that of the approximately $10,000,000 available for the use of stations during the year nearly 65 per cent was expended strictly for research and experimental purposes. For regulatory and public service work something over $500,000 was used and nearly $200,000 for surveys of various kinds.

The growth of effort to extend the benefits of station investigations by making the results more widely applicable to special problems and local conditions is reflected in an increase in substations, local experiments, and like agencies. A recent inquiry as to the number and distribution of such agencies showed that there are now in operation, in addition to the 50 State experiment stations and 4 independent stations, about 125 of what may be properly termed substations and about 180 experimental test or demonstration farms affiliated with the stations. It is stated as "evident that such extension of the station experiments meets with popular approval and legislative support, sometimes, however, to the embarrassment of administrative officers and to the neglect of or inadequate provision for other important needs of the stations."

Appreciation of the need of more fundamental research and of improved methods, technique, and equipment for this purpose was apparent, especially in a more critical examination of the scientific competency of field and feeding experiments, the development of experimental work depending upon improved means of controlling or taking accurate account of environmental factors, and in the progress of more advanced forms of investigations. The fields of economics, engineering, and genetics are cited as particularly noteworthy from this point of view.

Regarding economics, for example, it is shown that where 10 years ago the number of station projects and workers was relatively insignificant, there were reported for 1924 over 200 active projects and over 100 workers in economics definitely assigned to the station

staffs. "Despite limited resources, lack of competent investigators, and other difficulties incident to a new and distinctive research enterprise, a considerable amount of creditable and valuable work has been done, much of it through regional and national cooperation. To an increasing extent the methods of scientific research are being effectively applied to the collection and interpretation of economic facts. The opportunity for leadership by the experiment stations in this field is being more fully recognized and emphasized."

For agricultural engineering likewise a growing interest in the development of more formal investigation is reported, despite an inadequate supply of properly trained men and facilities. Although the number of projects for the year was slightly smaller than in 1923, a distinct advance is noted in the research character of the projects and the number of members of the station staff engaged in the work. Opportunities in this field are characterized as undoubtedly large.

The number of active projects in the comparatively new field of genetics is put at over 100. One feature of the report is the inclusion of three special articles reviewing earlier station work in breeding with field crops, horticultural breeding, and investigations in animal genetics. The total number of references cited in these three lines are 239, 72, and 378, respectively, indicating considerable accomplishment, although attention is drawn to the many problems still unsolved.

For field crops there are suggested as promising lines for further research "investigations of the inheritance of earliness in certain cereals and cotton, studies of the characters concerned with yield, and genetic analyses of the factors involved in resistance to drought, diseases, insects, and to lodging and unfavorable soil conditions. Legumes, grasses, and the sorghums will undoubtedly receive more attention in the future. Additional cytological studies with important crops would supply much information essential to rapid progress in plant breeding investigations."

As to animal genetics the need is emphasized for "much more data on the inheritance of the characters of economic importance. It may not be possible to accumulate sufficient data at one institution for a proper analysis of such characters, especially in the larger animals. Herein may lie an opportunity for cooperative experiments in which several institutions have a part. The fundamental physiological factors underlying reproduction have likewise not received the attention which they deserve, and progress is at a standstill in certain lines of work until more is known of the physiological factors related to reproduction and development."

Another special article in the report deals with the status of home economics research. A survey of the 1924 projects indicates

that 17, or about one-third, of the stations were not engaged in any research which has direct application to home economics, and that only 4 stations were supporting research projects conducted in home economics departments as such. None the less no fewer than 130 projects are enumerated of direct bearing on some phase of home economics, these being distributed among 33 stations and 14 different departments of inquiry. Most numerous among the groups were the 35 projects carried in agricultural and biological chemistry departments, 26 in agricultural economics and rural sociology, 13 in dairy husbandry, and 8 each in animal husbandry and agricultural engineering.

"The total volume of station work of the best type was never larger or more promptly put to practical use. Agricultural research has, however, reached a difficult and critical stage in its development which may lead to a decrease in volume of striking and quickly applicable results. The simple problems have in large measure been solved or the means of solution worked out. Discoveries likely to revolutionize practice are less frequent. More profound and complex problems, requiring new technique and methods and deeper and clearer insight into the relations of cause and effect, have been uncovered. Routine applications of conventional methods will no longer suffice. Whether this stage shall mark the beginning of an era of diminishing returns in agricultural research, as has been suggested, will depend upon the attitude of those engaged in the work of both administration and investigation and the use they make of their opportunities and means. As public servants, the station administrators will be depended upon to make the most of the available resources and facilities and to guard against ineffective and unprofitable effort. On the other hand, the individual investigator will be expected to assure himself that his research is growing in effectiveness and not merely increasing in volume without improving in kind."

The year 1924 was one of steady progress in agricultural experimentation, though the stations were still handicapped considerably by a lack of funds and in some cases by an absence of trained specialists. The report makes plain the need of the assistance along these lines which the passage of the Purnell Act has now begun to provide. It also suggests from a constructive point of view some of the other ways in which the station work may be strengthened, and it is gratifying to note that progress is already being attained in some of these directions.

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

Carbohydrate studies, I, II (*Amer. Jour. Physiol., 73 (1925), No. 2, pp. 387–400, figs. 3*).—Two papers are presented.

I. *The relative sweetness of pure sugars*, A. Biester, M. W. Wood, and C. S. Wahlin.—Attempts to determine the relative sweetness of varying concentrations of sucrose by the usual tasting methods having given unreliable results, a new method was devised and tested. This consisted in determining the lowest concentration of a given sugar which tasted sweet to 20 different observers. Precautions were taken to use constant volumes and temperatures of the solution to be tested, to rinse the tongue with distilled water and dry it before the test, to apply the test on the same area and locality, and to eliminate the sensation of smell. One series of solutions for each sugar was tested before going to another concentration. The concentrations were in all cases checked with a Schmidt and Haensch saccharimeter.

Using an arbitrary value of 100 for sucrose, the numerical ratings of the various sugars tested were lactose 16, raffinose 22.6, galactose 32.1, rhamnose 32.5, maltose 32.5 (?), xylose 40, dextrose 74.3, and levulose 173.3.

II. *The relative sweetness of invert sugar*, J. J. Willaman, C. S. Wahlin, and A. Biester.—Using the method described in the above paper, the authors have compared the relative sweetness of invert sugar prepared by the use of invertase and by the solution of equal weights of pure dextrose and levulose.

The values obtained, 127.4 and 130, respectively, check closely the value of 130 which may be predicted from the values reported in the previous paper for levulose and dextrose and with values reported by various observers, but do not confirm the conclusions recently reported by Sale and Skinner (E. S. R., 47, p. 808), who considered invert sugar to be less sweet than sucrose. The discrepancies in results are thought to lie chiefly in the method employed in measuring sweetness and possibly to the presence of compounds other than sugars. The method employed by the authors is considered to be capable of greater accuracy than previous methods.

Sugars and sweetness (*Jour. Amer. Med. Assoc., 85 (1925), No. 13, pp. 977, 978*).—An editorial comment on the above.

Lactose: A review, E. O. Whittier (*Chem. Rev., 2 (1925), No. 1, pp. 85–125, figs. 2*).—This review of the literature on lactose is presented under the headings historical, sources, biosynthesis, distinguishing tests, determination, hydrolysis and utilization, bacteriological, oxidation and hydrogenation, chemical effects of heat, derivatives, structure, isomerism and equilibria, general physical data, manufacture, and quality, specifications, and uses. An extensive list of literature references is appended.

Animal and vegetable fats and oils, W. L. Austin and H. J. Zimmerman (*Washington: [U. S.] Bur. of the Census, 1925, pp. 16*).—This continues for 1923 and 1924 the statistical reports on the production, consumption, imports, exports, and stocks of animal and vegetable fats and oils in the United States (E. S. R., 53, p. 203).

[Chinese tung-oil nuts], R. W. RUPRECHT (*Florida Sta. Rpt. 1924, pp. 53, 55*).—Data on the composition of two samples of Chinese tung-oil nuts, *Aleurites moluccana* and *A. fordi*, are reported as follows: Meats 31.45 and 60.20 per cent, hulls 68.55 and 39.80, moisture in meats 8.80 and 3.65, oil in meats (ether extract) 58.20 and 57.15, and oil in whole nut 18.33 and 34.30 per cent, respectively. *A. fordi* is considered the better variety of the two on account of its higher percentage of oil in the whole nut and the better drying qualities of the oil.

The absorption of phosphate by Pasteur-Chamberland filters, F. W. PARKER (*Soil Sci., 20 (1925), No. 2, pp. 149–158*).—In this study of the extent of absorption of phosphates by the Pasteur-Chamberland filter, the Denigés ceruleam molybdate method slightly modified in technique from that described by Atkins (E. S. R., 52, p. 311) was used with various soil extracts having a phosphate content not higher than 1 part per million of PO_4, with solutions of potassium acid phosphate containing 0.2 and 1 part per million of PO_4, and with old and new Pasteur-Chamberland filters. Data were obtained on successive washings from filters which had been used with the soil extract and on successive portions of phosphate solution after passing through the filter.

The results obtained show that new filters contain considerable phosphorus soluble in water but do not absorb phosphorus, and that previously used filters absorb considerable phosphorus from solutions containing it. This shows that the phosphorus content of a solution can be increased or decreased in passing through the candle, depending upon the phosphorus content of the solution and the condition of the filter. The absorption of phosphorus is considered to be due largely to soil colloids held in the pores of the filter candle. Treatment of used filters with concentrated hydrochloric acid and subsequent ignition in an electric furnace did not destroy completely the phosphate-absorbing power of used filters.

The occurrence and distribution of manganese in plants (*Kentucky Sta. Rpt. 1924, pt. 1, pp. 17, 18*).—This progress report includes in addition to a summary of work previously noted (E. S. R., 53, p. 310) the statement that normal cow's milk contains small but appreciable amounts of copper, manganese, and zinc, and colostrum several times as much of these metals. "From the results obtained with whole milk, butterfat, skim milk, and other substances containing vitamins, it appears that copper is associated with fat-soluble A, manganese with water-soluble B, and zinc with vitamin C. The evidence obtained seems to show that copper, manganese, and zinc, in connection with iron, are of fundamental importance in the metabolism of both plants and animals."

Continuous reproduction of microorganisms in synthetic media, C. H. WERKMAN (*Science, 62 (1925), No. 1596, pp. 115, 116*).—The controversial literature on the requirement of yeasts and certain bacteria for vitamin B or bios and their possible synthesis by microorganisms is reviewed, and experiments are reported in which special care was taken to avoid every possible trace of substances of the nature of bios in the media used for the growth and reproduction of a considerable number of pure cultures of yeast and different bacteria.

With the yeasts, the medium E base of Fulmer, Nelson, and Sherwood (E. S. R., 45, p. 565) at 30° C. ± 1° with succinic acid, methose, glycerol, or dextrose proved capable of supporting continuous growth and reproduction of 14 races of *Saccharomyces cerevisiae*, 1 *Torula rosea*, 1 *T. liquefaciens*, 1 *Oospora lactis*, and 1 *S. ellipsoideus*. With the same energy sources and a base of K_2HPO_4 2 gm., $MgSO_4$ 0.1 gm., Fe_2Cl_6 trace, $(NH_4)_2SO_4$ 2 gm., $CaCl_2$

0.1 gm., and water 1 liter continuous growth and reproduction were secured with the following organisms: *Escherichia coli*, *Aerobacter aerogenes*, *Proteus vulgaris*, *Pseudomonas fluorescens*, *Encapsulatus pfeifferi*, *P. cyanogena*, *Bacillus megatherium*, *B. mycoides*, *B. subtilis*, *Serratia marcescens*, *Azotobacter chroococcum*, and *Rhizobium leguminosarum*.

The author concludes that certain yeasts, torulae, and bacteria may be grown continuously in a wholly synthetic medium without the addition of vitamin B or substances of the nature of bios, and that if such substances are necessary they are metabolized by the organism.

Proteins of wheat bran.—II, Distribution of nitrogen, percentages of amino acids and of free amino nitrogen: A comparison of the bran proteins with the corresponding proteins of wheat endosperm and embryo, D. B. JONES and C. E. F. GERSDORFF (*Jour. Biol. Chem., 64 (1925), No. 2, pp. 241–251*).—Continuing the investigation previously noted (E. S. R., 50, p. 711), the authors have analyzed the proteins isolated from wheat bran—a prolamin, a globulin, and an albumin—by the Van Slyke method for the distribution of nitrogen and the percentages of basic amino acids. The results, together with data obtained for tyrosine, tryptophane, and cystine by colorimetric methods which have been noted from another source (E. S. R., 52, p. 802), are as follows: In the prolamin, cystine 2.29, arginine 4.41, histidine 0.84, lysine 2.45, tryptophane 1.37, and tyrosine 3.38; in the albumin, cystine 3.29, arginine 10.04, histidine 2.57, lysine 4.51, tryptophane 4.76, and tyrosine 4.2; and in the globulin, cystine 1.52, arginine 14.13, histidine 2.76, lysine 11.84, tryptophane 2.85, and tyrosine 3.69 per cent.

As compared with the proteins of wheat endosperm the bran proteins are characterized by their relatively high content of basic amino acids and of the nutritionally essential amino acids, lysine, tryptophane, and cystine.

The globulins of the jack bean (Canavalia ensiformis).—II, The content of cystine, tyrosine, and tryptophane, J. B. SUMNER and V. A. GRAHAM (*Jour. Biol. Chem., 64 (1925), No. 2, pp. 257–261*).—Improved methods are given for the purification of the three globulins concanavalin B., concanavalin A, and canavalin, previously isolated from the jack bean (E. S. R., 40, p. 308), with data on the content of tryptophane, cystine, and tyrosine as determined by the colorimetric method of Folin and Looney (E. S. R., 47, p. 504). These data are as follows: Canavalin 0.24, 1, and 5.5 per cent of tryptophane, cystine, and tyrosine, respectively; concanavalin A 2.2, 0.4, and 5.2; and concanavalin B 2.3, 3.2, and 9.4. The discrepancy between some of these results and those reported by Jones, Gersdorff, and Moeller (E. S. R., 52, p. 802) is pointed out and discussed.

Glutenin—a simple method for its preparation and direct quantitative determination, M. J. BLISH and R. M. SANDSTEDT (*Cereal Chem., 2 (1925), No. 2, pp. 57–67*).—The technique of the method described is as follows:

A weighed portion (8 gm.) of flour is thoroughly mixed in a 200-cc. flask with 50 cc. of water and 5 cc. of N NaOH from a pipette with vigorous rotation of the flask. The mixture is shaken at 10-minute intervals for an hour, after which pure acetone-free methyl alcohol is added in 50-cc. portions to a volume of 200 cc. An additional 5 cc. of the alcohol is added, and the clear supernatant liquid is decanted through a cotton plug. A 50-cc. portion is pipetted into a 100-cc. Erlenmeyer flask, a few drops of bromothymol blue are added, and the glutenin is precipitated by adding N/5 HCl from a burette, with constant shaking until a distinct color change occurs, the end point being a light olive color corresponding to a pH of about 6.4. After an hour or two

the contents of the flask are poured into a 100-cc. centrifuge tube and centrifuged for 10 minutes, after which the clear liquid is poured off and the disc of glutenin transferred with a little distilled water to a Kjeldahl flask, where the usual nitrogen determination is made.

The results obtained with this method agree very closely with those obtained by the indirect method of Sharp and Gortner (E. S. R., 51, p. 803). That the precipitate is pure glutenin is considered to be established by the agreement of the percentage of ammonia nitrogen yielded after complete hyrolysis with 20 per cent HCl with the reported determinations on 8 samples of pure glutenin by the Van Slyke method.

Attention is called to the fact that the optimum H-ion concentration for the precipitation of glutenin from freshly prepared flour extracts by the new method differs appreciably from that for glutenin prepared by Osborne's standard method (E. S. R., 19, p. 762). It is suggested that the apparent difference in the isoelectric points may be due to changes in the sulfur complex of glutenin caused by the extensive treatment with alkali involved in the standard method.

Glutathione (*Nature [London], 116 (1925), No. 2915, pp. 412, 413*).—A review of recent literature on the subject.

A micro method for determining nitrogen, A. R. Rose (*Jour. Biol. Chem., 64 (1925), No. 2, pp. 253–256, fig. 1*).—The method described involves the use of a special digestion tube, a special acid mixture of high oxidizing power, and direct nesslerization. The tube is made from a 25 by 250 mm. pyrex test tube by drawing the bottom to an obtuse point and bending the tapering end at an angle of about 20° to the long axis of the tube. The acid mixture consists of 100 cc. of concentrated sulfuric acid and 160 cc. of 60 per cent perchloric acid made up to 500 cc. with ammonia-free water.

The procedure consists in heating over a micro burner a sample estimated to contain from 0.25 to 2 mg. of nitrogen with 1 cc. of the acid mixture and with a solid glass bead to minimize bumping. After the mixture becomes dark-colored and evolves fumes, 3 drops of hydrogen peroxide are added and the heating is continued with exposure of a minimum of surface until nearly all the color is removed, after which an additional 3 drops are added and the heating is continued for from 3 to 5 minutes after the solution is clear. From 3 to 4 cc. of water and 8 cc. of 2 N sodium hydroxide are added, and the mixture is diluted to 50 cc. and mixed, after which 5 cc. of Nessler's reagent diluted to 25 cc. is added. The solution is then diluted to the 80 or 100 cc. mark and matched against a nesslerized solution of 0.5, 1.0, or 1.5 mg. of ammonium sulfate per cubic centimeter.

Phloridzin.—II, The hydrolysis and estimation of phloridzin, E. M. Harvey (*Oregon Sta. Bul. 215 (1925), pp. 18–23, figs. 2*).—In connection with the investigation of phloridzin in apple and pear tissue noted elsewhere, a study was made of the accuracy of the procedure used by the author in previous studies (E. S. R., 50, p. 741). This was the same as the method described by Darwin and Acton[1] for the estimation of maltose, the hydrolysis procedure calling for 2½ hours' boiling in 2 per cent hydrochloric acid.

A study of the influence of different factors upon the reaction both in pure phloridzin solutions and in extracts of apple tissue showed that the amount of material used should be such as to contain from 40 to 100 mg. of phloridzin, and that the time of hydrolysis, using 2 per cent hydrochloric acid, should be reduced to 15 minutes. It was also shown that in total sugar determinations

[1] Practical Physiology of Plants. Cambridge, Eng.: Univ. Press, 1901, 3. ed., p. 285.

made upon apple and pear tissue by the usual inversion procedure (treatment for 10 minutes at 70° C. with 5 cc. concentrated HCl) an error is introduced owing to the slight hydrolysis of phloridzin. Inversion by an invertase solution is recommended to avoid this error.

Determination of copper numbers of cellulose materials, C. J. Staud and H. LeB. Gray (*Indus. and Engin. Chem., 17 (1925), No. 7, pp. 741–744, figs. 4*).—A study of the sources of error in the Schwalbe method of determining the copper number of cellulose is reported, and a modification of the method is described, with data on its application to various cellulose materials. It was found that by using 30 cc. of alkaline tartrate to 20 cc. of copper sulfate and boiling the mixture for 15 minutes no precipitate of cupric oxide and less than 0.1 mg. of cuprous oxide were obtained, and these proportions were consequently adopted throughout the investigation.

The optimum time and temperature of heating were first studied. In all cases with increasing time up to 30 minutes there was an increase in the copper number, but after this length of time the value remained constant. With increasing temperatures the amount of cuprous oxide increased, but the temperature-copper number curves for different materials were not parallel, thus precluding the possibility of applying a corrective factor for errors in temperature. A temperature of 100° C. and a time of 45 minutes were selected as the optimum conditions. On lowering the temperature from 100 to 75° some of the cuprous oxide dissolved, but could be reprecipitated by raising the temperature again to 100°. The precipitated cuprous oxide was not converted to any extent into cupric on contact with the air.

In the determination of the cuprous oxide by the ferric alum method, 100 cc. of 2 N sulfuric acid was found to be sufficient for washing when a 3-gm. sample was used. Variations in weight of sample from 1 to 6 gm. were found not to alter appreciably the value of the copper number.

[Cider and vinegar studies at the Illinois Station] (*Illinois Sta. Rpt. 1924, p. 136*).—Preliminary experiments by A. C. Vogele have led to the conclusion that the only practical means of preserving sweet cider is pasteurization in sealed containers. Unsatisfactory results were obtained with sodium benzoate.

A study of a large number of wild yeasts isolated from Illinois apples showed marked variations in their fermentation characteristics. It is concluded that failure to produce a marketable vinegar can occasionally be traced to the presence of undesirable yeasts which cause an off-fermentation. The use of a pure culture yeast in vinegar making is recommended.

METEOROLOGY

Meteorological summaries for the year 1924 (*Kentucky Sta. Rpt. 1924, pt. 1, pp. 51–53*).—Data regarding temperature, precipitation, wind, and cloudiness recorded at the United States Weather Bureau Station at Lexington, Ky., for 1924 and previous years are summarized in a series of tables.

Meteorological observations [at the University of Maine, Orono, J. S. Stevens] (*Maine Sta. Bul. 321 (1924), pp. 176, 177*).—A summary is given of monthly and annual temperature, precipitation, cloudiness, and wind during 1924. The mean temperature for the year was 40.98° F., as compared with 42.82° for 56 years. The precipitation was 37.05 in., as compared with the 56-year mean of 41.19 in. The snowfall was 79.5 in., the number of clear days 117.

Meteorological report for the year 1924, E. Burke (*Montana Sta. Rpt. 1924, pp. 64–66*).—A brief summary is given of observations at Bozeman, Mont.,

on temperature, precipitation, evaporation, cloudiness, and winds. The mean temperature for the year was 40.7° F.; the highest 95°, August 28; the lowest −29°, December 28. The last killing frost occurred June 7, the first September 27. The coldest 8-day period since 1880 was recorded in December following an unusually warm spell. The annual rainfall was 20.78 in., the snowfall 57.62 in. The annual precipitation was 1.73 in. above normal. An excess of precipitation of 1.08 in. in September aided germination and growth of wheat. Subnormal precipitation in June reduced the wheat yield. The total evaporation, April to October, inclusive, was 34.3 in. The number of clear days was 212.

Climatological summary for State College, Pennsylvania, 1924 (*Pennsylvania Sta. Bul. 196 (1925), p. 35*).—A table is given which shows monthly and annual temperature, precipitation, and cloudiness. The mean temperature for the year was 46° F., the highest temperature 92° August 6, and the lowest −7° February 24. The total annual precipitation was 39.64 in. The number of clear days was 120.

Climate [of the Big Bend Country, Washington], B. HUNTER, G. SEVERANCE, and R. N. MILLER (*Washington Col. Sta. Bul. 192 (1925), pp. 12–27, figs. 9*).—The "Big Bend Country" is a large area of scanty rainfall in east-central Washington, devoted primarily to wheat alternating with summer fallow, approximately one-half of each farm being in wheat each year while the other half is in summer fallow, two years being required to produce a crop.

Data for temperature, precipitation, evaporation, and humidity for the region, compiled from reports of the United States Weather Bureau and the substations at Lind and Waterville, are summarized in tables and diagrams.

Although tempered somewhat by Pacific air currents, the climate is continental in character. "Being sheltered by the Rocky and Bitter Root Mountain Ranges, the area is less subject to the cold waves that sweep down from the Canadian Provinces than is the region lying to the east of these mountain ranges. However, temperatures of 20 to 25° below zero are sometimes reached during these cold spells. On the other hand, the Cascade Mountains lying just to the west serve as a barrier in shutting off the tempering influence of the Pacific Ocean. As a result the summer heat is very much greater than that of the region lying west of the Cascade Range and temperatures of 100° or more somewhere in the area occur every summer." The heat is, however, rarely oppressive, and prostrations seldom occur.

"The average annual precipitation varies from less than 7 in. along the Columbia River in Franklin County to about 15 in. in the northeastern part of Lincoln County. In the more arid localities wheat is produced under a scanter precipitation than in any other part of the United States. The area is more or less subject to periods of both high and low annual precipitation."

There are well defined wet and dry seasons of the year. "The wet season occurs during the late fall, winter, and early spring months and the dry season during the summer. Some years the dry season may extend from March to October. The prevailing moisture bearing winds are from the southwest and west. In passing over the Cascade Range, the air currents lose much of their moisture, it being precipitated as snow or rain on the western slope of the mountains. In descending the eastern slope of the Cascade Range into the valleys below, the air becomes warmer and much drier. Its capacity for holding vapor continues to increase until the low elevations along the Columbia River are reached where the average annual precipitation is between

6 and 7 in. and where there is a preponderance of dry air, clear sky, and heavy evaporation during much of the year. As the winds pass in a northeasterly direction from the Columbia River to the higher altitudes of the Big Bend Plateau, the air becomes cooler and its capacity for holding vapor is gradually reduced. This results in a more or less regular increase in the annual precipitation as the elevations increase." As would be expected, humidity of the air is low and evaporation high.

Fluctuations in yields and prices result in variations in the area and quality of land in cultivation. Very low yields appear to be usually associated with low annual and low April, May, and June precipitation, and vice versa. May and June rains are even more important than annual precipitation. Yields are also affected by temperature, evaporation, cloudiness, and winterkilling.

SOILS—FERTILIZERS

[**Soil fertility studies at the Illinois Station**] (*Illinois Sta. Rpt. 1924, pp. 8–23, 25–28, figs. 13*).—Data from 32 soil experimental fields located in different parts of the State are briefly summarized. These experiments have established the value of growing crops in a rotation in which legumes have a regular place, of maintaining the nitrogen supply of the soil by conserving all manures and growing leguminous green crops, and of supplying the necessary mineral nutrients in an economical form.

Studies of dunesand land by F. C. Bauer and H. J. Snider indicate that the greatest needs of soils of this type are for organic manures and for lime.

Experiments by E. E. DeTurk and O. H. Sears to determine the effect of fineness of rock phosphate on its effectiveness when used on different soils have shown that the increases in crop yields from the more finely ground phosphate, as compared with the coarser grades, are negligible.

Tests by Bauer, Snider, and A. U. Thor have shown that slag and rock phosphates are superior to acid and bone phosphates, although all of these forms have given appreciable increases in crop yields on brown silt loam soil. Experiments by Bauer and Snider to compare raw rock phosphate and steamed bone meal when used with organic manures and limestone in both grain and livestock systems of farming showed that both forms of phosphate gave profitable returns. The bone meal showed some advantage over rock phosphate. A comparison of acid and rock phosphates by Bauer, Snider, and A. H. Karraker showed that on yellow-gray silt loam soil acid phosphate gave the biggest increase in wheat yields, but that rock phosphate produced the largest increase in corn yields.

Experiments by DeTurk on the effectiveness of different sizes of limestone showed that the relative value of coarse limestone, or that which is made up of particles larger than 20 mesh, is quite low as compared to that of finer stone. This is not taken to indicate that limestone coarser than 20 mesh should not be used, but that the coarse material should make up only a small part of a given amount of limestone. An investigation of the commercial limestones sold in the State showed that approximately 2 per cent was too coarse to pass through a 4-mesh screen and that 17 per cent was fine enough to pass through an 80-mesh screen.

Experiments by Bauer, Snider, and J. Lamb, jr., showed that light applications of limestone gave good results. Data on the effect of different forms, amounts, and finenesses of lime materials on crop yields are tabulated, but no conclusions are drawn. Experiments by Bauer, Snider, and Lamb emphasized the lasting effects of limestone even on very acid soils. A single large applica-

tion gave excellent returns, closely approaching those secured on plats where frequent applications were made.

Three years' experiments by Sears, T. E. Richmond, and F. M. Clark on three experimental fields showed that late spring plowing of sweet clover gives neither an immediate increase in crop yields nor an increase in the supply of available nitrogen when compared with earlier plowings. No appreciable differences could be found in the nitrate nitrogen content of the experimental soils which could be traced to the time of the plowing under of sweet clover. It is concluded that no benefits of any significance can be had by postponing the time of plowing under of sweet clover in order to get the greatest growth of this green manure crop.

Studies by Bauer and Snider to determine the approximate number of sweet clover plants produced per acre under different systems of soil management and the approximate weights of roots and tops on a dry basis at the time the crop is plowed for green manure, showed that the number of plants varies with the soil treatment. The results for three years showed that the number of plants varied from 200,000 to 600,000 per acre on soil treated with organic matter, limestone, and rock phosphate. Usually no plants lived through to the second season on untreated soils, although some very fertile soils produced a good stand without treatment. Limestone was found to be the first limiting factor in the production of sweet clover on most soils. During the three years the amount of sweet clover plowed down for green manure on the various experimental fields varied from 300 to 6,800 lbs. per acre on an air-dry basis, with an average of 1,500 to 2,500 lbs. per acre.

[Soil fertility studies at the Nebraska Station] (*Nebraska Sta. Rpt. [1924], pp. 14-17*).—Laboratory investigations on the effect of moisture and temperature variations on nitrification in soils showed that nitrate production increased at an exponential rate as the temperature was increased, up to 35° C. (95° F.). Beyond this point nitrification decreased, and at 55° all accumulation of nitrates ceased. At temperatures as low as 5° nitrification was negligible. Nitrate production increased directly with moisture content up to one and one-fourth the field carrying capacity. Soils were found to differ in quantity of nitrate production at different temperatures and moisture contents. At optimum water content typical eastern Nebraska soils produced very little nitrates when the temperature was below 15°, while at the same wetness typical western Nebraska soils produced a sufficiency of nitrates.

Laboratory studies on the effect of drought conditions on nitrification showed that the superior nitrification rates found in western Nebraska soils may be due to the frequency with which these soils are subjected to drought.

Field experiments on the response of wheat to nitrates showed that wheat made better response to nitrates artificially applied at intervals throughout the spring than when applied all at one time in the fall. There were no indications that the fall application was lost by leaching. Soil treatments designed to increase the nitrification rate of the soil gave yields of wheat comparable with the best tillage methods. Statistical studies of climatic data for Nebraska show that in eastern Nebraska the weather may be a limiting factor in nitrate production in the spring for wheat in about one in four years.

Investigations of parallelisms between the glacial and loess soils of southeastern Nebraska showed that the glacial soils differ from the loess soils in that the former have a very pronounced clay horizon, differing from the same level in the loess soils, not so much in mechanical analysis and chemical composition as in properties of plasticity, tenacity, cohesion, etc. The soil-forming material, and not climate, is responsible for these differences.

Studies of the various soil properties determining tilth showed that loss of organic matter is apparently the biggest factor reducing tilth quality. The loss of 30 per cent of the organic matter on six Nebraska farms lowered the scouring point of soils from 40 per cent moisture to 30 per cent and also increased the stiffness of the soil when wet and the hardness when dry.

Investigations of the effect of lime on the physical properties of soil showed that the granulating effect and physical improvement due to lime resulted in a small economy in water storage and conservation. However, organic matter in the form of manure was somewhat superior to lime.

Studies of the relation of the organic matter and nitrogen contents of prairie soils to soil types showed that established upland virgin prairie soil types are homogeneous with respect to organic matter and nitrogen. Soil types with destructional topography like bluff lands, and soils of constructional features like alluvial lands, are not homogeneous in organic matter and nitrogen. The organic matter content of the surface foot of virgin prairie soils is close to 20 times the nitrogen content. In established virgin upland prairie soil types the nitrogen content decreases with coarseness of texture and with decrease in rainfall.

Studies on the loss of organic matter and nitrogen from cultivated soils on several farms showed that from 20 to 50 per cent of the original organic matter and nitrogen in the soil has been lost. Where erosion has occurred the loss in these constituents has reached 70 per cent on many farms. On farms where attention has been paid to soil maintenance by the return of manure and crop residues and the growing of legumes, the decline in organic matter and nitrogen is very little.

[Soil studies at the Texas Station] (*Texas Sta. Rpt. 1923, pp. 9–11, 18*).—It is stated that the determination of organic carbon in the soil throws little light on the quality of the soil, and is hardly necessary for ordinary analysis. The percentage of organic carbon can be judged from the percentage of nitrogen present, and the average percentage of pentosans increases with the average nitrogen content of the soil. Surface soils were found to contain slightly more pentosans in proportion to nitrogen than subsoils, but the difference was very small. Pentosans in cottonseed meal disappeared rapidly from the soil during the first week, and at the end of eight weeks 7 per cent of the original pentosans were present from cottonseed meal, 31 per cent from Sudan grass, 61 per cent from rice bran, and 75 per cent from sheep manure.

The amount of reducing substance, calculated as sugars and produced by heating the soil with 1.25 per cent sulfuric acid, varied from 0.002 to 0.215 per cent, with an average of 0.058 for 77 soils. No relation could be found between the nitrogen soluble and insoluble in permanganate and the results with pot experiments with nitrogen on soils. A 10 per cent salt water solution dissolved an average of 0.005 per cent of nitrogen from 43 soils containing an average of 0.146 per cent total nitrogen. On an average 10 per cent of the nitrogen was dissolved by N/10 potassium hydroxide from 21 soils.

Analyses and pot experiments with soils from Brazos and Jefferson Counties indicated that these soils are not deficient in sulfur. Sulfur exercised a harmful effect upon some of the soils of Brazos County and increased the acidity of some. No relation was found between the percentage of nitrogen and sulfur in the sorghum grown in pots. The soils of Brazos County were found to contain more sulfur than phosphoric acid. Field experiments at Temple indicated that elemental sulfur slightly decreased the yield of cotton.

Data are also briefly reported on the results of soil fertility experiments with different rotations and fertilizer treatments.

[**Soil analyses by the Florida Station**], G. E. TEDDER (*Florida Sta. Rpt. 1924, p. 137*).—Analyses of seven samples of Everglades soils are given.

Classification of Ohio soils, G. W. CONREY (*Ohio Sta. Bimo. Bul., 10 (1925), No. 9, pp. 163–169, figs. 2*).—Data are briefly reported which indicate the possibility of dividing the State of Ohio into a number of soil areas within which the soils are similar as regards mode of origin and character of parent material. These divisions include residual limestone soils, residual sandstone and shale soils, glacial limestone soils, glacial sandstone and shale soils, old glacial limestone soils, old glacial sandstone and shale soils, lacustrine limestone soils, and lacustrine sandstone and shale soils.

Summer fallow tillage, B. HUNTER, G. SEVERANCE, and R. N. MILLER (*Washington Col. Sta. Bul. 192 (1925), pp. 29–37*).—The results of fallow tillage experiments at Moro, Oreg., and Waterville and Lind, Wash., are briefly summarized. These indicate the importance of working the summer fallow reasonably early in the spring. The important feature appears to be the establishment of the soil mulch before the weeds and volunteer grain have made sufficient growth to reduce the soil moisture supply materially. Keeping the land free from weeds after it is plowed also appears to be as important as the early spring tillage.

Moisture conservation, B. HUNTER, G. SEVERANCE, and R. N. MILLER (*Washington Col. Sta. Bul. 192 (1925), pp. 37–39*).—A brief summary of data given more in detail elsewhere is presented (E. S. R., 46, p. 216; 52, p. 620).

Nitrification studies [**at the Kentucky Station**] (*Kentucky Sta. Rpt. 1924, pt. 1, p. 39*).—Data from determinations of the amounts of nitrates in the crop rotation plats under wheat and in fallow soil after tobacco, hemp, oats, soy beans, and corn are briefly reported.

Base exchange in soils (*[London]: Faraday Soc., [1925], pp. 549–617, figs. 7*).—At a meeting of the Faraday Society, held in London on December 9, 1924, five papers on the subject abstracted below were presented and discussed, as well as two others on Base Exchange in Relation to Absorption, by E. A. Fisher; and Base Exchange in Relation to the Swelling of Soil Colloids, by E. A. Fisher.

Base exchange in soils, D. J. HISSINK (In *Base Exchange in Soils. [London]: Faraday Soc., [1925], pp. 551–566, figs. 2*).—Studies of Dutch soils are reported which showed that the diminution of the lime content of the clay substance of heavy clay soils primarily affects the structure of the soil. Only after a further decrease of the lime content does the acidity of the soil make itself felt. It was further found that the proper structure of heavy clay soils is due not only to the degree of saturation of the clay substance but also to the high content of calcium carbonate, which, in the form of calcium bicarbonate, causes flocculation of the clay suspension.

Data on the proper amount of lime to use for the improvement of the structure of heavy clay soils are presented.

The rôle of the electronegative ions in the reactions between soils and electrolytes, N. M. COMBER (In *Base Exchange in Soils. [London]: Faraday Soc., [1925], pp. 567–572, fig 1*).—A brief summary of data on the subject is presented.

Studies on base exchange in Rothamsted soils, H. J. PAGE and W. WILLIAMS (In *Base Exchange in Soils. [London]: Faraday Soc., [1925], pp. 573–585, figs. 2*).—Studies conducted at the Rothamsted Experimental Station are reported which showed that, in the soil of Broadbalk field containing an excess of chalk, the relative proportions of the different bases vary consistently with the manure. In all the soils about 90 per cent of the exchange-

able bases consists of calcium. The total content of exchangeable bases can be correlated with the amount of fine inorganic material and of organic matter. It is considered probable that there is a gradual conversion of exchangeable potash to a nonexchangeable form, or vice versa, depending on whether or not potassic fertilizers are nsed.

It was further found that in the acid soil of the grass plats from which chalk is absent, the soils are all unsaturated and the amount of exchangeable calcium can be correlated with the pH of the soil. The bearing of these results on current theories of base exchange in soils and on the relation between soil acidity and ionic exchange is discnssed.

Base exchange in relation to the problem of soil acidity, G. W. Robinson and R. Williams (In *Base Exchange in Soils. [London]: Faraday Soc., [1925], pp. 586–593*).—Studies conducted at the University College of North Wales are reported. The authors' conceptions of soil acidity are elaborated on, and the studies on Welsb soils containing small quantities of clay but large amounts of organic matter showed that the condition of unsaturation, or the presence of free aluminosilicic and humic acids, is not inconsistent with fertility, and that many soils in this condition do not respond to liming.

An examination of such soils by the Hissink method revealed the presence of considerable proportions of exchangeable calcium. On the other hand, certain soils which responded to lime were found to contain only small proportions of exchangeable calcium. Extraction of soils with dilute solutions of carbon dioxide showed that the availability of calcium runs parallel with the exchangeable calcium content.

Low contents of exchangeable calcium were found in upland soils subjected to excessive leaching. In the soils of valley bottoms the exchangeable calcium was high, although on account of the considerable proportions of organic matter present complete saturation with respect to bases was not reached. It is suggested that this distribution of acidity may be general in acid soils, tending to occur in upland soils of sandy or gravelly texture and exposed to excessive leaching.

The relation between the pH value, the lime requirement, and the thiocyanate colour of soils, S. J. Saint (In *Base Exchange in Soils. [London]: Faraday Soc., [1925], pp. 594–598*).—Studies conducted at the University of Leeds are reported which showed that the relationship between the pH values, the lime requirements, and the thiocyanate colors of different soils is not consistent. The variations from soil to soil depend on several factors, and it therefore does not seem possible to forecast even approximately either the pH value or the lime requirement of a soil from the thiocyanate color unless data already have been obtained regarding the relation of these three values on a comparable soil.

Soil experimental fields (*Kentucky Sta. Rpt. 1924, pt. 1, pp. 34, 35, 37–39*).—Data from fertilizer tests at the Russellville, Mayfield, and Lexington soil fertility experiment fields are briefly reported and discussed.

Chemical studies on the general fertilizer plots.—Effect of caustic lime on soil treated with barnyard manure, J. W. White and F. J. Holben (*Pennsylvania Sta. Bul. 196 (1925), pp. 9–11, fig. 1*).—The results of studies of two manured plats at the end of 40 years of continuous treatment indicate that caustic lime in soil treated with barnyard manure has stimulated nitrogen fixation and the decay of organic matter, and has increased the nitrogen, dry matter, and organic matter contents of the soil. There was less readily soluble humus in limed than in unlimed soil.

Recovery of nitrogen oxides from gas mixtures by adsorption on silica gel, J. A. ALMQUIST, V. L. GADDY, and J. M. BRAHAM (*Indus. and Engin. Chem., 17 (1925), No. 6, pp. 599–603, figs. 8*).—Studies conducted at the U. S. D. A. Fixed Nitrogen Research Laboratory are reported, in which the adsorption efficiency and capacity of two samples of silica gel for dry nitrogen peroxide were determined for various conditions of temperature, concentration, and rate of gas flow.

The results indicated the desirability of low temperature adsorption from the standpoints of both capacity and adsorption efficiency. The rate of flow had no effect on the ultimate capacity of the gel, but was found to be an important factor in determining the amount of gel required for a given duty.

Dry nitrogen peroxide was readily recovered from the gel by distillation at 100° C. (212° F.), and it is considered probable that somewhat lower temperatures could be used to advantage. It is thought that the comparatively large temperature range between efficient adsorption and recovery would present difficulties in commercial operation using granular gel, since a large mass of gel would have to be continually subjected to this temperature cycle. For this reason the use of powdered silica gel appears more promising, since in this form it can be carried continuously by the gas stream from the adsorption tower to the recovery chamber.

In recovering nitrogen oxides by means of silica gel from a mixture containing water vapor, the difficulties of regeneration were found to be greatly increased by the formation of nitric acid in the gel pores.

It was found that the ratio of nitrogen oxides to water in the recoverable product will depend on the concentration of each in the gas phase and also on the length of time the gel has been exposed to the gas mixture. If the concentration of water vapor is 1 per cent or less, the gel will continue to adsorb water long after it has begun to pass practically all of the nitrogen oxides. For this reason it is considered desirable in practice, in case granular gel is used, to use the first tower as a water adsorber, which would pass dry nitrogen oxide on to the main body of gel.

Colloidal silica and the efficiency of phosphates, P. L. GILE and J. G. SMITH (*Jour. Agr. Research* [*U. S.*], *31 (1925), No. 3, pp. 247–260, pl. 1*).—Studies conducted by the U. S. D. A. Bureau of Soils are reported, in which it was found that the addition of silica gel to millet grown in sand culture greatly increased the growth of plants supplied with rock phosphate and only slightly increased the growth of plants supplied with acid phosphate. The addition of a mixed gel containing iron, alumina, and silica to a pot receiving rock phosphate was marked by reduced growth as compared with the growth made in pots receiving no phosphoric acid. The growth made by the plants in the different pots was approximately proportional to the quantities of phosphoric acid in the plants, but seemed to bear no relation to the quantities of silica taken up.

The beneficial action of silica gel on the growth of plants supplied with rock phosphate is ascribed to an increase in the availability of this phosphate due to an increase in the quantity of phosphoric acid in solution. Similarly the deleterious effect of the mixed gel is ascribed to a diminishing of the quantity of phosphoric acid in solution, owing to soluble iron and aluminum produced by base exchange. This conclusion is substantiated by the quantities of phosphoric acid found in solution on shaking up rock phosphate with silica gel and a nutrient solution such as was used in the experiment.

A criticism is made of the idea that the increased growth of plants observed in similar experiments is due to an increased assimilation of silica which enables the plant to prosper with less phosphoric acid.

Report on inspection of commercial fertilizers, 1925, E. M. BAILEY (*Connecticut State Sta. Bul. 270 (1925), pp. 3–90*).—This bulletin contains a list of registrations of fertilizers offered for sale in the State during 1925 and guaranties and actual analyses of 690 samples of fertilizers and fertilizer materials collected for inspection.

Analyses of commercial fertilizers, R. N. BRACKETT and H. M. STACKHOUSE (*South Carolina Sta. Bul. 224 (1925), pp. 57*).—Guaranties and actual analyses of 1,236 samples of fertilizers and fertilizer materials collected for inspection in South Carolina during the season 1924–25 are reported.

AGRICULTURAL BOTANY

Phloridzin.—I, The significance of phloridzin in apple and pear tissue, E. M. HARVEY (*Oregon Sta. Bul. 215 (1925), pp. 5–17, figs. 5*).—In continuation of previous studies (*E. S. R., 50, p. 741*), the author gives an account of investigations on the occurrence of the glucoside, phloridzin, and its probable function in apple and pear tissues.

Apple and pear trees are said to contain the greatest quantity of phloridzin in the early summer, coincident with the period of highest metabolic activity. At such times phloridzin may increase to 20 per cent of the total solids, or to 5 to 6 per cent of the fresh weight of the tissue. Pear shoots were found to contain nearly always more water, slightly more total sugars, and about twice as much phloridzin as the apple. On any given date, phloridzin was found most abundant at the tip of the shoot and uniformly less toward the base. In the tip of a shoot, for a relatively short time early in the growing season, phloridzin increased to a maximum, from which point it fell during the remainder of the season. The middle and basal portions of shoots did not show the above type of maximum occurrence. The amount of phloridzin in the tip of the shoot is said to be somewhat correlated with the rate of growth. The maximum content, however, lagged one or two weeks behind the maximum growth rate.

The author's observations are said to have led to a general conclusion that the phenol acids, upon which the synthesis of phloridzin depends, are a sort of by-product of metabolic activity, and that phloridzin serves as a protection against an accumulation of these substances, or as a temporary repository of them for future use by the tissue.

The nitrogenous metabolism of Pyrus malus (*Pennsylvania Sta. Bul. 196 (1925), pp. 4, 5*).—Brief accounts are given of preliminary investigations by W. Thomas on the nitrogen metabolism in apple leaves, short spurs, and longer growths. Drying was found not to have an important influence on total nitrogen. The slight differences noted between the fresh and dried material are said to have no effect on the metabolism, especially with the nonprotein constituents. Colloidal ferric hydroxide was found a satisfactory reagent, as it gave a sharp separation of protein from its decomposition products. It is claimed that either the water-insoluble protein of the leaves consists of a single protein, or if it contains more than one protein they must be nearly alike in their amino acid make-up. This is said to be significant with respect to the carbohydrate-nitrogen ratio in its relation to plant metabolism.

Some particularities of the evolution of plastids [trans. title], L. K. TCHANG (*Bul. Soc. Bot. France, 71 (1924), No. 5–6, pp. 656–666, pl. 1, figs. 2*).—Noting that recent work by Guilliermond, Emberger, and Mangenot has proved the existence in chlorophyllous plants of two kinds of chondriosomes distinct as to morphological and histochemical characters (one related to photosyn-

thesis and concerned with elaboration of chlorophyll and starch, the other not yet well understood as regards function), and reviewing related findings or opinions by others, the author gives the results of his own observations on bean, pea, and potato. From these, he claims to have shown that in pea the large grains of reserve starch which are formed before the maturation of the seed retain a slight mitochondrial cap, which, just preceding growth at the beginning of germination and during the elaboration of chlorophyll, regenerates a chloroplast while the starch grain undergoes digestion. Similar phenomena are observable during germination in potato tubers, but phenomena of a different sort are described for bean, and the differences are discussed as to their significance.

The author's studies are considered to confirm results claimed by Belzung (E. S. R., 7, p. 275), and to have shown that, in general, plastids do not necessarily undergo destruction in functioning, or at least that exceptions occur to the functional destruction of plastids, which in all probability takes place rarely and only after very active functioning.

Chemical variations in grafted plants [trans. title], L. Daniel and J. Ripert (*Compt. Rend. Acad. Sci.* [*Paris*], *177* (*1923*), *No. 19, pp. 894, 895*).—In continuance of studies previously noted (E. S. R., 48, p. 221) bearing on variations in chemism in grafted plants, the authors have studied grafts employing *Tanacetum boreale*, *Chrysanthemum frutescens*, belladonna, and tomato regarding the changes, relations, and characters in some of the chemical products mentioned of the grafted plants.

The influence of electrolytes on the swelling of agar [trans. title], S. Dokan (*Kolloid Ztschr.*, *34* (*1924*), *No. 3, pp. 155–161, figs. 7*).—The author points out in connection with data and conclusions as detailed that electrolytic influence on the colloidal state varies so greatly with the nature of the colloid that it has not yet been possible to express such effect in a form which is accurate or which can have consistent meaning. However, the electric and other influences which are effective need to be considered in connection with different concentrations of the media.

Studies in swelling.—I, The swelling of agar-agar gels as a function of water content before swelling, B. L. Clarke (*Jour. Amer. Chem. Soc.*, *47* (*1925*), *No. 7, pp. 1954–1958, fig. 1*).—The purpose of this paper is to present experimental results which indicate the general form of the curve obtained when the percentage swelling of agar-agar gels in distilled water is plotted against the water content of the gel immediately before swelling. The general form, as ascertained, of the curve relating swelling capacity of agar-agar gels to water content is presented, and the aging of agar gels is interpreted in terms of this relation. An optical change, occasioned by drying, is shown to be connected with the water content-swelling relation. A program for the extension of this work has been suggested.

The hydrophilic effect of ions on agar and protoplasmic components, D. T. MacDougal and B. L. Clarke (*Science*, *62* (*1925*), *No. 1597, pp. 136, 137*).—This article is largely devoted to a discussion of related views set forth in the above noted articles by Dokan and Clarke and the treatise of Michaelis (E. S. R., 54, p. 108).

"The results of scores of workers show that the action of ions on colloids, and consequently on permeability of walls and plasmatic layers, are not to be accounted for solely by electrostatic effects, determined by sign and valency. Such effects are due to the direct action of ions on colloidal particles. Differential or lyotropic effects among univalent ions, for example, are to be attributed to the varying attraction of the different elements for water molecules,

thus exerting an indirect effect on the hydration of the colloidal particle, as is well described by Professor Michaelis, who suggests that the nature of such attraction depends on atomic radius. As noted, he believes these effects are not seen at low concentrations, except in the case of the hydrogen ion. The results cited in this note establish well-marked differential action of common univalent and bivalent ions at extremely low concentrations in conformity with the lyotropic series, and give greater value to the proposal of Michaelis as to the physical basis of such effects."

Stomatal behavior of plants in the greenhouse in winter, H. B. Smith (*Mich. Acad. Sci., Arts, and Letters, Papers, 2 (1923), pp. 109–117*).—From a study of *Tradescantia fluminensis, Nephrolepis exaltata, Adiantum cuneatum, Fuchsia speciosa, Coleus blumei, Primula kewensis, Beta vulgaris*, and *Phaseolus vulgaris*, the author concludes that the stomata of *T. fluminensis* and *N. exaltata* open on clear days in winter about sunrise and close shortly after sunset. They open earlier and close later, hence require less light, than do those of *A. cuneatum, B. vulgaris, C. blumei, F. speciosa, P. kewensis*, and *P. vulgaris*. Stomata of *A. cuneatum, F. speciosa, B. vulgaris*, and *P. vulgaris* may open late in the afternoon if the light intensity increases at that time.

From a study of 15 species named, it is concluded that stomata are never open at night in the winter. Other observations are given.

The general conclusion drawn is that light is the governing factor in winter for the opening and closing of stomata, but that the intensity necessary for opening differs for the various species.

Further studies on isoelectric points for plant tissue, W. J. Robbins and I. T. Scott (*Jour. Agr. Research* [*U. S.*], *31 (1925), No. 4, pp. 385–399, figs. 3*).—In a previous publication (E. S. R., 52, p. 124) it was shown that plant tissues act much like an amphoteric colloid having an isoelectric point, and it was also indicated that the ability of *Fusarium lycopersici* to attack tomato plants is correlated with the H-ion concentration of the soil solution (E. S. R., 51, p. 51).

The present paper deals with experiments with potato tuber tissue, root tips of soy beans, and mycelial mats of *F. lycopersici, F. oxysporum*, and *Gibberella saubinetii*. All the experiments show that under the conditions imposed the plant tissues acted very much like amphoteric colloids with isoelectric points.

It is concluded, under the particular conditions of the experiments, that the plant tissues act much like amphoteric colloids, with isoelectric points as follows: Potato tuber tissue at pH 6.4, soy bean root tips at 6.2 to 6.44, mycelium of *G. saubinetii* at 6.2, *F. lycopersici* at 5.5, and *F. oxysporum* at 4.9.

Photosynthesis, E. C. C. Baly (*Indus. and Engin. Chem., 16 (1924), No. 10, pp. 1016–1018*).—A brief exposition and discussion are given of selected portions or features of contributions named on the effect of wave length on formaldehyde, quartz test tube experiments, photosynthetic production of sugars, formaldehyde production by other photosynthetic methods, theories of conversion by plants, experimental difficulties, properties of formaldehyde and its polymerization products, and a few experiments on a somewhat enlarged scale.

Biology of Azotobacter [trans. title], C. Stapp and G. Ruschmann (*Arb. Biol. Reichsanst. Land u. Forstw., 13 (1924), No. 3, pp. 305–368, figs. 3*).—Azotobacter, here systematically dealt with in some detail, is very insensitive to drying and to diffused light, but it is sensitive to high temperatures and to changes in the reaction of the medium.

Nardus stricta, J. de Coulon (*Mém. Soc. Vaud. Sci. Nat., No. 6 (1923), pp. 245–332, figs. 42*).—A detailed account is given of this comprehensive embryological, anatomical, and physiological study of matgrass (*N. stricta*).

GENETICS

The application of the science of genetics to the farmers' problems, J. W. Gowen (*Sci. Agr., 5 (1924), No. 1, pp. 1-12, fig. 1; abs. in Maine Sta. Bul. 321 (1924), pp. 173-175*).—This is a popular account of the application of the results of genetic investigations to the practical improvement of plants and animals.

[Genetic investigations with dairy cattle at the Illinois Station] (*Illinois Sta. Rpt. 1924, pp. 114-117, fig. 1*).—The results of two projects are briefly noted.

Crossbreeding experiment has wide scope (pp. 114-116).—The continuation of this project by W. L. Gaines, W. W. Yapp, and M. H. Campbell has yielded results which mainly conform to those noted from other sources (E. S. R., 52, p. 429; 53, p. 128). In general the characters of economic importance appear to be inherited in a very complicated manner, which, if Mendelian, indicates that a large number of factors are responsible.

Simple method of testing sires developed (pp. 116, 117).—A method for evaluating the breeding ability of a sire has been worked out by W. W. Yapp, which is based on the increase in 4 per cent milk yield of the daughters of the sire as compared with the records of the dams of the daughters. The correction on a 4 per cent fat basis is made according to the formula previously noted (E. S. R., 50, p. 75). Using this method, bulls of the Holstein and Jersey breeds were studied and the persentage increases which 25 noted bulls of each breed produced were found to vary widely, from 89.4 to 265.6 in the case of the Holsteins and 76.2 to 185.1 per cent for the Jerseys. It was also found that the bulls whose daughters have the highest records were not necessarily the bulls with the highest transmitting ability, due to the influence of the dams.

Inheritance of milk production, J. W. Gowen (*Sci. Agr., 4 (1924), No. 12, pp. 365-380, figs. 5; abs. in Maine Sta. Bul. 321 (1924), pp. 172, 173*).—A popular discussion of the results of studies on the inheritance of milk production with reference to their practical application.

Nicotiana deformis and the enzym theory of inheritance [trans. title], J. A. Honing (*Nederland. Kruidk. Arch., Nederland. Bot. Ver., 1923, pp. 55-57*).—*N. deformis* appeared in Deli tobacco in Sumatra in 1914. Some resemblance is noted between features of this plant and the results of certain diseases.

Genetic and morphological comparison of two kinds of rumplessness in the fowl, L. C. Dunn and W. Landauer (*Abs. in Anat. Rec., 29 (1924), No. 2, p. 143*).—Investigations at the Connecticut Storrs Experiment Station with several rumpless fowls have indicated that this abnormality may be due to a dominant factor for rumplessness or to an irregularity in embryonic development. The types are indistinguishable except through breeding experiments. Crosses of heterozygous rumpless fowls with normals have produced 31 rumpless and 21 normal offspring. Inter se matings of heterozygous rumpless fowls have produced 9 rumpless and 3 normal. All normals have resulted from crosses of the nonhereditary rumpless fowls with normals. Based on observations with 10,000 chicks, it has been calculated that an accidental rumpless individual occurs in a ratio of about 1 per 1,000. Anatomical studies indicated that in both types the oil gland is absent, and that the caudal vertebrae are represented at most by a remnant of one or two.

Associations between number of kernel rows, productiveness, and deleterious characters in corn, C. H. Kyle and H. F. Stoneberg (*Jour. Agr. Research [U. S.], 31 (1925), No. 1, pp. 83-99*).—In field experiments carried on

in several Southern States by the Bureau of Plant Industry, U. S. D. A., prolific corn varieties were more productive as a class than comparable nonprolific sorts. The ears of the prolific varieties had fewer rows of kernels and smaller diameters, and the kernels were less angular than in the nonprolific varieties.

When groups of ears, within both prolific and nonprolific varieties, and within several F_1 crosses were compared, those with fewer kernel rows, larger kernels, or less angular kernels were more productive. In comparisons between and within varieties, the lots with fewer kernel rows produced smaller numbers of barren plants and, in some cases, made larger total yields in spite of a smaller yield per bearing plant as measured by a yield index, $I=A\times B^2$, where A is the average length of total ears per bearing plant and B the average diameter of ears.

Selection for different numbers of kernel rows in selfed lines resulted in an essentially regular increase during five generations in the degree of conformity to the parental number. The rate of this increase was greatest in the lines with the fewest rows and decreased as the number of rows increased. Selection also resulted incidentally in other differences, e. g., lines having fewer kernel rows had a greater length of ear per plant, ears with a smaller diameter, and kernels more rounded and with less indentation than lines having larger numbers of kernel rows. The lines with fewer rows were also more resistant to corn smut, had fewer plants with heritable deleterious characters, and were generally more vigorous and productive.

Relation between certain heritable properties of wheat and their capacity to increase protein content of grain, W. F. Gericke (*Jour. Agr. Research [U. S.], 31 (1925), No. 1, pp. 67–70*).—Studies at the University of California with nine wheat varieties have indicated that certain relationships exist between the ratio of grain to total weight and the capacity to ripen after nitrogen application, both of which are considered heritable characters, and their capacity to produce high protein grain. These relationships may aid plant breeders and agronomists to obtain wheat varieties which will produce high protein grain even under relatively unfavorable soil and climatic conditions. See also earlier notes (E. S. R., 48, p. 529; 50, p. 326; 51, p. 738).

The nature of size inheritance, K. Sax (*Natl. Acad. Sci. Proc., 10 (1924), No. 6, pp. 224–227; abs. in Maine Sta. Bul. 321 (1924), pp. 165, 166*).—Recent experimentation (E. S. R., 52, p. 431) on size inheritance in beans was carried to the F_3. In this, even more striking differences were found when larger numbers of individuals were studied. It appears evident that some of the differences in seed weight are also dependent on size factors which are inherited in a simple Mendelian manner, the presence of several such factors resulting in so-called blending inheritance.

A more complete analysis was made on certain F_3 segregates to determine the relation between pattern and pigmentation with total yield, average seed weight, and number of seeds per plant, and some of the data are tabulated. Since the mottled pattern is dependent on a single factor, the differences observed in total yield are also dependent on one or more factors in a single chromosome. Comparing only the self-colored and mottled segregates, it appears that the factors in a single linkage group cause an increased yield of approximately 25 per cent, and the increase in yield of the mottled segregates would probably be even greater if all of these individuals were homozygous for the mottling factor. The average yield of the white segregates is approximately intermediate between the self-colored and mottled classes. In-

creased yield can be obtained by increasing the number of beans per plant or by increasing the average weight of the seed.

The results show clearly that differences in size and total yield are, to some extent at least, dependent on genetic factors which are linked with factors for simple qualitative differences and are, therefore, inherited in the usual Mendelian manner. The association of differences in total yield with certain qualitative characters may be of value in selecting superior segregates in hybrids of economic species. Cases have been found where a factor for large size was contributed by the smaller parent.

An approximate method of calculating coefficients of inbreeding and relationship from livestock pedigrees, S. WRIGHT and H. C. MCPHEE (*Jour. Agr. Research* [*U. S.*], *31* (*1925*), *No. 4*, *pp. 377–383*).—A method for calculating the coefficients of inbreeding and relationship (E. S. R., 51, p. 228) is described, which is based on random sampling of the ancestors. For this method it is only necessary to have two-column pedigrees of the individuals, taking sires or dams at random. The degree of inbreeding is then expressed as 50 per cent of the total population having common ancestors in two lines. The probable error is calculated in the usual way for the percentage of the individuals showing common ancestors. The method may be applied to individuals by determining the percentage of ties in a large number of two-column samples from the pedigree. Determination of the inbreeding of individuals occurring frequently should be made from complete pedigrees, and ties in which they are involved should be weighted accordingly. The coefficient of relationship may be similarly determined. Tests of the reliability of the approximate method as compared with the use of complete pedigrees have checked closely.

Inbreeding with White Leghorns with particular reference to egg production, H. D. GOODALE (*Abs. in Anat. Rec., 29* (*1924*), *No. 2, p. 143*).—Inbred matings of various kinds have been maintained since 1919 and continued as brother and sister matings since 1921. These lines are showing diverse characteristics, but so far egg production has decreased in all, though in certain matings it has been fairly well maintained. Higher egg production resulted when inbred lines were crossed.

Linkage groups IV and VI in Drosophila virilis, C. W. METZ and M. S. MOSES (*Abs. in Anat. Rec., 29* (*1924*), *No. 2, p. 145*).—The results of studies of the linkage groups in the department of genetics of the Carnegie Institution have indicated that crossing over is partially or completely inhibited in the IV chromosome of *D. virilis*. About 5 per cent of crossing over has been observed in the VI chromosome. The identification of the chromosomes is as yet somewhat uncertain, but two mutant characters in chromosome VI resemble characters known to be associated with the dotlike chromosome in *D. melanogaster*. None of those in group IV bear such a resemblance.

A comparison of the effects of X-ray and temperature on linkage in Drosophila, J. W. MAVOR and H. K. SVENSON (*Abs. in Anat. Rec., 29* (*1924*), *No. 2, p. 146*).—In investigations at Union College, Schenectady, N. Y., dealing with the effect of X ray and temperature on the crossing over in the black-to-curved region of the second chromosome of *D. melanogaster*, it was found that increases in the crossover value of flies X-rayed and treated with heat occurred at approximately the same time, that is, in the flies resulting from eggs laid on the sixth or seventh day after the treatment started.

The crossing over in the black-to-purple region appeared one day earlier in heat treated females than the crossing over in the purple-to-curved region, the former in eggs laid on the sixth day after the treatment started and the latter in eggs laid on the seventh day. The increased crossing over persisted for 14 and 15 days after a single X-ray treatment lasting 20 minutes.

Linkage relations in the sex-chromosome of the domestic fowl, D. C. WARREN (*Abs. in Anat. Rec., 29 (1924), No. 2, pp. 143, 144*).—A study of the behavior of barring, *B*, rate of feathering, *R*, and shank color, *D*, in crosses of Single Comb White Leghorns and Jersey Black Giants at the Kansas Experiment Station has indicated linkage relations in the sex chromosome. In a total of 70 individuals involving *B* and *R*, a crossover value of 47.1 per cent was obtained. In 111 individuals *D* and *B* showed crossover percentages of 48. Due to the masking effect of certain characters, other relations could not be obtained.

Chromosome behavior in a genus cross, K. and H. J. SAX (*Genetics, 9 (1924), No. 5, pp. 454–464, pls. 2; abs. in Maine Sta. Bul. 321 (1924), pp. 169, 170*).—Crossings between *Aegilops cylindrica* and Marquis wheat (*Triticum vulgare lutescens*) resulted in the production of several seeds. These were planted in the fall of 1921, yielding 2 F_1 plants, more or less intermediate in appearance and unusually vigorous vegetatively, but completely sterile, the pollen grains with very few exceptions being obviously imperfect. It is stated also that E. F. Gaines has made "numerous crosses of *A. cylindrica* with several *vulgare* wheats, and in some crosses about 2 per cent of the spikelets set seed."

A. cylindrica has 14 haploid chromosomes and Marquis 21 gametic chromosomes. In the first reduction division of the pollen mother cells of the F_1 plant there are about 7 bivalent and 21 univalent chromosomes, due presumably to the pairing of 7 Aegilops chromosomes with 7 wheat chromosomes. If the single chromosomes are distributed at random in the reduction divisions, as is considered probable, then the chromosome number of the gametes will vary from 7 to 28.

Sterility in this genus cross is ascribed to the incompatibility of certain chromosomes and to chromosome differences in the parents, both of which factors result in univalent chromosomes in the reduction divisions of the F_1 hybrid. It is thought that a new species with 28 chromosomes may be derived from this genus cross, but that the likelihood of such a number is very small. The behavior of the chromosomes in this cross suggests the possible origin of the *vulgare* wheats from a cross of Aegilops with a wheat species of the emmer series. The chromosomes of the two genera, Aegilops and Triticum, are more compatible with each other, as indicated by the number which pair, than the chromosomes of certain species within a given genus.

FIELD CROPS

[Field crops investigations in Florida], W. E. STOKES, R. W. RUPRECHT, H. MOWRY, and G. E. TEDDER (*Florida Sta. Rpt. 1924, pp. 7, 25–46, 52, 53, 54, 62, 134, 135, figs. 2*).—The continuation (E. S. R., 52, p. 224) is reported of variety tests with sorgo, sorghum, peanuts, oats, rice, corn, and miscellaneous legumes; fertilizer tests with peanuts, Napier grass, and sweet potatoes; breeding work with peanuts, Merker grass, and Napier grass; and intensive studies with pasture and lawn grasses. Special comment is made on the behavior of *Panicum repens*, Para grass, Napier grass, carpet grass, Bahia grass, Dallis grass, and kudzu. The progress of forage crops work at the Everglades Substation is reported on briefly.

Napier grass will probably furnish abundant grazing if grazed cautiously. Continuously grazed plats were completely killed in six months, whereas the intermittently grazed plats stood up well. It apparently pays to keep Napier

grass well cultivated while being grazed. Napier grass unfertilized again surpassed the highest yielding varieties of sorghum and corn, although both of the latter were liberally fertilized. Napier grass and Japanese cane responded strikingly to sewage irrigation. The yields of Napier silage in response to different fertilizer treatments are tabulated. Analyses showed that the several fertilizers had practically no effect on the amounts of the different elements taken up by the plant.

Large, late-maturing sorghum varieties continued to give the heaviest yields. On Norfolk sand soil good varieties of sorghum will outyield corn. Their low yields did not indicate sunflowers to be a possible silage crop. Consistent differences in the quality of sirup due to the fertilizer treatment were not observed where different forms of potassium were applied to sugar cane.

The yields in a sweet potato fertilizer test, in harmony with previous trials, showed the need for potash and nitrogen for sweet potatoes on Norfolk sand. Fertilizers applied to sweet potatoes again showed no significant residual effect on a following peanut crop.

The yields of peanuts continued to be depressed by applications of ground limestone. This deleterious effect of lime was also noticed on corn and velvet beans. Incomplete fertilizers on peanuts have rendered no average increase over untreated plats on typical Norfolk sand. Application of gypsum gave increases in combination with all fertilizer treatments and on untreated plats.

Tobacco seed planted in the greenhouse August 14 first matured March 26, approximately half by April 15, and all by June 20.

[Field crops investigations in Illinois] (*Illinois Sta. Rpt. 1924, pp. 38–43, 46–58, 147–149, figs. 4*).—The average yields of corn varieties leading in tests in different parts of the State are tabulated for comparison. The results of cultivation experiments considered with other factors suggest for average conditions three cultivations properly done as the maximum both from the viewpoints of profitableness during a particular season and of weed control over a long period.

The effect of continuous selection in different strains of corn has been noted (E. S. R., 52, p. 433). According to a study by L. H. Smith and A. M. Brunson, careful mass selection from the field is about as effective as a practical means of building up corn yields as the pedigree ear-row breeding plat. The value of the utility score card as a measure of the yield in the field was demonstrated in a test by J. C. Hackleman.

Results obtained by S. S. Carney to date indicate that mature corn is better for seed than corn selected in the milk or dent stages, especially if the seed is to endure severe conditions between picking and planting. Compared with mature seed, immature corn contained less dry matter, had lower specific gravity, germinated quicker although not maintaining this advantage, developed more molds, lost more material through leaching, and yielded slightly less. Studies of methods of drying showed that when mature corn germinated it produced more dry weight of seedling, and the seed sustained less injury when heated than did immature corn. Slight heating considerably injured corn harvested in the milk stage, and severe heating killed corn picked in the milk and dent stages, whereas mature corn subjected to severe heating germinated 70 per cent. Corn harvested in the milk stage dried without artificial heat yielded 68.9 bu. per acre, dried at about 41° C. yielded 67.4 bu., and at about 42.5° yielded 62.9 bu.

Results obtained by W. L. Burlison and G. H. Dungan show that where soy beans are grown with corn to be hogged off there is an actual loss in the

amount of grain produced and slight gain in the total amount of feed, corn, and beans combined. The high protein content of the beans, however, may give the combination crop a somewhat higher feeding value per acre.

New strains of sweet corn varieties were isolated by W. A. Huelsen. His preliminary tests showed that sweet corn does not withstand the high temperatures necessary for rapid artificial curing and efficient drying. As low as 40° C. killed the seed. It appeared that sweet corn grown on soils treated with acid phosphate shows more iron sulfide black, a serious defect in the canned product, than sweet corn grown in untreated adjacent plats.

Notable among the small grain varieties tested by R. W. Stark were durum, Marquis, and Illinois No. 1 spring wheats, Oderbrucker and Wisconsin Pedigree barley, and Iowa 103 oats. An improved strain of Turkey wheat and efforts to obtain a smooth awned barley are also described. The hard winter wheat varieties of the Turkey type were found peculiarly adapted to the soil and climatic conditions of central and northern Illinois, while the soft varieties are best suited to southern Illinois. In milling and baking tests of wheat varieties grown on the several experiment fields, most sorts of hard wheat showed fair quality, and some made flour of excellent strength. Several of the soft wheats produced flour of poor strength and the resulting loaves were inferior. A few of the soft wheats produced strong flour from which excellent bread could be baked. The soft wheats are primarily suited to the milling of pastry flour.

Experiments by O. H. Sears and E. E. DeTurk indicated that winter mulching wheat with straw may be highly profitable in exceptional years. Some varieties of wheat rather susceptible to winterkilling may be benefited more than more resistant sorts. Mulch applied in February was much less effective than that put on in December, suggesting that much of the winterkilling probably was done by severe January weather. Applications of 2 tons of straw an acre seem more satisfactory than either 1 or 3 tons.

[Field crops experiments in Kentucky, 1924] (*Kentucky Sta. Rpt. 1924, pt. 1, pp. 31, 32, 33, 34, 35, 36*).—Even with the lightest seeding of soy beans in combination with corn the average total yield of beans and corn was somewhat less than that of the corn alone. Heavy seedings of soy beans were very injurious to corn, seriously reducing both yield and quality. A light seeding of soy beans in corn intended for hogging down might be profitable but would scarcely pay from the viewpoint of fertility alone. In both normal and droughty years corn planted in ordinary rows significantly outyielded that planted in double widths.

Clover seeded under various conditions from early February until April has generally produced good stands. No relation was observed between the time of seeding clover and killing by drought or heaving during the following fall and winter. The stands secured by drilling averaged a little thicker in most seasons than those obtained by the other methods.

On the heavily infested Lone Oak field, wild onions seemed to be controlled by fall and spring breaking followed by disking and harrowing whenever onions appeared until about June 15, when soy beans or corn were planted. Onions were not found from the time of planting soy beans until wheat was sown on October 20.

Trice strains and Express led in acre yields of seed cotton and percentage at first picking on the Mayfield experiment field.

[Cereal and forage crop studies in Montana], C. McKee (*Montana Sta. Rpt. 1924, pp. 12–15, figs. 4*).—Notable among varieties in continued experiments (E. S. R., 52, p. 434) were Newturk and Montana No. 36 winter wheat,

Victory oats, Trebi barley, early flint corn, and early Mammoth Russian sunflowers. While the acreage of flax grown under irrigation is small, tests showed that good yields may be obtained on land which can be irrigated uniformly. According to seeding trials with sunflowers, early planting has a decided advantage in the Gallatin Valley.

[**Field crops investigations in Nebraska, 1924**] (*Nebraska Sta. Rpt. [1924], pp. 12–14, 30, 36, 37, 38*).—Previous results in corn breeding work (E. S. R., 51, p. 831) were confirmed, indicating the superiority of pure line F_1 combinations over the original corn, and that new hybrid seed must be produced annually rather than to select seed from the F_1 progeny. Material reduction in yield has resulted in all generations beyond the first cross. The 1924 work suggests permanently recombining a relatively large number of pure lines and thereby restoring a productive, superior, open-pollinated variety as one practical means of utilizing the pure-line strains. Such seed has produced somewhat more than seed of the original commercial variety.

As in previous years, the water requirement of corn has been found to correlate rather closely with the evaporation rate from a free water surface, which in turn varies with seasonal climatic conditions. The amount of water transpired per pound of dry matter has decreased somewhat with the application of manure or fertilizer. However, the total amount of water used by the corn plant in its growth to maturity has not decreased, because with the greater fertility larger plants are produced. Work with small grains (E. S. R., 52, p. 529) and forage crops (E. S. R., 53, p. 433) has been noted elsewhere.

By rogning diseased plants from seed plats early and often, seed potatoes can probably be produced in eastern and central Nebraska and in the irrigated as well as in dry land regions of western Nebraska. The progress of tuber index and certification work is noted briefly.

Outstanding in cropping system studies at the Scottsbluff Substation was the increased crop yield resulting from the inclusion of alfalfa or sweet clover in the rotation or the use of barnyard manure. Annual applications of manure materially increased the carrying capacity of tame grass pastures. Sugar beets seeded after sweet clover sown with oats had been pastured off gave marked yield increases in comparison with beets not following sweet clover.

Clover seedings were again unprofitable at the Valentine Substation, where the sheet water was more than 3 ft. from the surface during the spring, some of the best stands being obtained with the water not more than 12 to 16 in. below. During the growing season when all vegetation was using water rapidly, the water table dropped about 2 ft. Early varieties of soy beans in cultivated rows, Kanred, Nebraska No. 60, and Minturki winter wheat, Prelude spring wheat, Nebraska 21 oats, and Amber sorgo gave the most satisfactory yields.

[**Agronomic experiments in Pennsylvania**], C. F. Noll and D. E. Haley (*Pennsylvania Sta. Bul. 196 (1925), pp. 6, 7, 11, 12*).—In the period 1920–1924 Japan oats have averaged 2,102 lbs. per acre, 4 barley varieties 1,697, the best barley 2,093, spring emmer 1,184, and Blue Ribbon spring wheat 978 lbs. The best barley varieties have slightly surpassed oats in feeding value per acre, whereas emmer and spring wheat gave much lower returns than either.

Different kinds and amounts of nitrogen carriers seemed to affect profoundly the nicotine content of plants of *Nicotiana rustica* (E. S. R., 52, p. 535). Frosting of the plants appeared to increase their nicotine content, and a further increase was noticeable after harvesting. A parallelism was apparent between the humidity of the air in the curing shed and the catalase content of the

Hibshman strain of Pennsylvania Broadleaf tobacco, but this response seemed to be governed largely by the fertilizer treatment and methods of curing used.

[Crop tests in Texas] (*Texas Sta. Rpt. 1923, pp. 18, 19*).—During periods of years at the Spur Substation cultivating twice during the season resulted in the highest yield of cotton, and feterita made its largest average grain yields when cultivated three times during the season. The current results confirmed previous work, showing that weed growth is a greater factor in crop production than the method of cultivation. The easiest and cheapest way to kill weeds appeared to be by the ordinary method of cultivation. Results at the substations indicated that medium thick planting, 6 to 18 in. in the row, gives the highest cotton yields. Deferred thinning of cotton decreased the yield as compared with thinning at the usual time.

Tests at the Beaumont Substation continued to indicate the value of ammonium sulfate as a fertilizer for rice.

The forage problem, B. Hunter, G. Severance, and R. N. Miller (*Washington Col. Sta. Bul. 192 (1925), pp. 40–42*).—Although alfalfa and sweet clover were the most promising of forage crops tested by farmers in Adams, Douglas, and Lincoln Counties, Wash., neither these nor any other forage crops were found that could compete with winter rye and winter wheat for pasture or hay in most of the region. Experiments at the Waterville and Lind, Wash., and Moro, Oreg. (E. S. R., 52, p. 435), Substations agree with farm experience.

Cereal hay production in California, G. W. Hendry (*California Sta. Bul. 394 (1925), pp. 3–58, 70, 71, figs. 16*).—The economic importance, uses, and production areas of cereal hay in the State are pointed out, the characteristics of the groups (E. S. R., 47, p. 631) are described, and cultural and hay production practices are outlined. Feeding trials are noted on p. 373.

Barley appeared to be the most valuable hay upon the basis of chemical analysis but was second to wheat in nutritive effect. Chevalier surpassed other barley varieties in hay yield, palatability, and nutritive effect, while beardless (Nepal) was inferior in these respects. Drought and late planting reduced the hay yield of barley to a lesser extent than with other cereals.

Wheat, under favorable circumstances, produced higher hay yields and contained more feed value per acre than the other cereals, but it produced less hay than barley under drought. White Australian (Pacific Bluestem) proved to be the most prolific hay wheat, excepting Velvet Don durum, which was inferior in palatability and nutritive effect and unsuited for hay.

Wild oats hay was less productive but surpassed cultivated oats hay in palatability and nutritive effect. Coastblack oats proved equally productive but less valuable for hay than California Red oats. Rye hay made fair yields but was low in palatability and nutritive effect.

The highest hay yields were obtained by cutting at stages of development peculiar to each cereal, and ranging for different varieties from "early milk" to "late soft dough." Immature wheat hay cut in the "blossom" was more palatable to dairy cattle than hay of the same variety cut at later development stages. Immature cereal hays have a higher percentage of leaves by weight and are richer in proteins and contain less fiber than mature cereal hays. Experience indicates that barley, wheat, and oats should be cut in the "milk" when intended for dairy cattle or saddle horses, and in the "soft dough" for work horses, mules, or stock cattle. Rye should be cut in the "blossom" or earlier for all purposes.

[Experiments with legumes in Illinois] (*Illinois Sta. Rpt. 1924, pp. 23–25, 33–37*).—T. E. Richmond and F. M. Clark did not find any native legume with a nodule organism which could cause an infection or nodules on the roots of

soy beans in the field. Among the legumes found to belong to the cowpea group in inoculation were mung bean, *Phaseolus cutifolius*, urd bean, rice bean, pigeon pea, hyacinth bean, *Crotalaria* sp., guar bean, *Voandzeia subterranea*, asparagus bean, and moth bean.

Experiments by W. L. Burlison and G. H. Dungan indicated that it is inadvisable to attempt to make hay from sweet clover the second year. It was found practically impossible to harvest a seed crop from common biennial sweet clover unless the crop is clipped back or pastured off during the early part of the season. At least one clipping is necessary, and two are preferable if seed is to be harvested.

Cutting alfalfa in the one-tenth bloom stage gave Burlison and Dungan higher yields than cutting in the full bloom stage. The extra labor needed to cultivate alfalfa after each cutting was not justified. Variegated or Grimm types of alfalfa and spring seeding have produced the best results to date.

Red clover was found by Burlison, Dungan, and W. P. Flint to yield more hay and seed when grown in rotation with oats, wheat, and corn than in rotation with corn, corn, and oats, the difference being expressed in the second cutting. The seed yields of alsike and mammoth clover and the merits of Cherokee clover (beggar weed), Korean lespedeza, dalea, kudzu, velvet beans, and ladino clover as acid resistant legumes are also indicated.

Barley: Culture, uses, and varieties, H. V. HARLAN (*U. S. Dept. Agr., Farmers' Bul. 1464 (1925), pp. II+33, figs. 10*).—This is a revision of and supersedes Farmers' Bulletin 968 (E. S. R., 39, p. 533).

The best yielding varieties are considered to be Tennessee Winter in the humid-winter region, Manchuria and Oderbrucker in the humid-spring region, and Coast, Hannchen, Club Mariout, White Smyrna, Chevalier, and Trebi in the semiarid region.

Tests of barley varieties in America, H. V. HARLAN, M. L. MARTINI, and M. N. POPE (*U. S. Dept. Agr. Bul. 1334 (1925), pp. 219, pls. 3, figs. 10*).—An exhaustive compilation is presented of the results of variety trials with barley conducted in the United States (except Alaska) and Canada. The history of barley production in the United States is reviewed, and the distribution of varieties by experiment stations is commented on. Besides the details of the individual experiments, the characteristics of well-known or promising varieties are set forth, the regional adaptation of varieties is indicated on a map of the United States and Canada and is discussed, and prominent sorts are compared botanically. The accession data of Cereal Investigations numbers are abridged in tabular form. The varieties giving the best yield in some or all of the five years from 1917 to 1921, inclusive, at each station, are listed in the order of productiveness.

Composition and maturity of corn, T. H. HOPPER (*North Dakota Sta. Bul. 192 (1925), pp. 3–76, pls. 6, figs. 18*).—Investigation was made to determine the composition and yields of the whole corn plant and ear and stover at uniform growth stages, namely, tassel, milk, dough, glazed, and ripe; to compare types of varieties with respect to time of maturity, plant height, and kernel type; and to study the relationship of maturity to chemical composition, particularly the dry matter content. See also an earlier study (E. S. R., 36, p. 36).

As the plant matured up to the glazed stage it was observed that in both ear and fodder the percentage of dry matter increased and in the dry matter the ether extract and nitrogen free extract increased, and the ash, crude protein, and crude fiber decreased. In the stover the dry matter percentage

increased, and in the dry matter the ash and crude fiber increased and the crude protein and nitrogen free extract decreased, while the ether extract remained about constant. Maximum production of dry matter and its constituents was attained in the ear and fodder at about the glazed stage. This and other evidence indicate that corn may be considered mature at the glazed stage, which is deemed the optimum time for ensiling.

Extreme differences did not occur in the average composition of the dry matter of varietal groups comprising early, medium, and late varieties, respectively, although some variations occurred which were consistent through the several growth stages. Although the flints were similar to the dents in average yields, the stover of the flints at all stages had the higher dry matter content and more crude protein in the dry matter, their stover loss was the smaller, and their ears contained the larger percentage of the dry matter in the fodder. In about one-third of the plant's life period the ear increased quantitatively until at the glazed stage its dry matter comprised nearly one-half of that of the whole plant.

The tassel (silking) period seemed to divide the plant life into two distinct periods, the first (planting to tassel) varying according to environmental conditions and to varietal characteristics, and the second (tassel to glazed) being quite constant and quite independent of environment and variety. The second period averaged 41 days and is subdivided rather definitely into tassel-milk, milk-dough, and dough-glazed sections, which averaged 16, 13, and 12 days, respectively. From the date of tasseling (80 per cent of the plants having silked) it is deemed possible to approximate when the corn will reach succeeding stages.

Maturity appears to be closely related to the dry matter content of the ear and fodder, particularly the ear. The curves given make it possible to approximate the maturity from the actual dry matter content, and vice versa. At an early frost date (100 days after planting) the early varieties, although short in stature, showed the maximum ear development, the largest ear yields, and the highest feeding values as measured in therms of net energy.

The influence of irrigation water and manure on the composition of the corn kernel, J. E. Greaves and D. H. Nelson (*Jour. Agr. Research* [*U. S.*], *31* (*1925*), *No. 2, pp. 183–189*).—Corn, grown on manured and unmanured plats on a highly calcareous soil on the Greenville farm of the Utah Experiment Station, received applications of water ranging from 0 to 40 in., in addition to about 18 in. of annual precipitation. Similar studies with small grains have been noted earlier (E. S. R., 53, p. 735).

Analyses revealed a decrease in the nitrogen content of the kernel due to the irrigation water and an increase due to the manure, the nitrogen content of the grain being a function of the available nitrogen content of the soil. The ash, calcium, phosphorus, and potassium contents were increased with the application of irrigation water, and all the constituents were greatly increased by manure. Varying quantities of irrigation water did not affect the nitrogen and magnesium content of the kernels greatly, whereas total ash increased up to about 20 in. of water, phosphorus 30, calcium 10, and potassium 40 in. The results appeared to confirm the view that the increased ash and mineral constituents of the grain are due to greater bacterial activity which increases the available plant food of the soil. The increased calcium, potassium, and phosphorus, and the narrower calcium-phosphorus ratio in the corn kernel grown with irrigation water seem to make such corn more valuable for human and animal nutrition than similar corn grown without irrigation water.

Corn breeding yields results (*Indiana Sta. Circ. 128 (1925), pp. 12, figs. 9*).—This popular discussion of recent corn improvement methods includes an article by H. A. Wallace, entitled Breeding Corn for Poor Land.

Flax facts, T. [E.] STOA (*North Dakota Sta. Circ. 26 (1925), pp. 8, figs. 2*).—A popular discussion of the uses of linseed oil and meal and flax straw is presented, with notes on the migration of flax culture, wilt control, and production and consumption of flaxseed.

Concerning the importance of the flax crop, T. [E.] STOA (*Northwest. Miller, 144 (1925), No. 11, p. 1082*).—Essentially noted above.

The mat bean (Phaseolus aconitifolius), P. B. KENNEDY and B. A. MADSON (*California Sta. Bul. 396 (1925), pp. 3–33, figs. 7*).—The characteristics and origin of the mat bean are set forth, and its environmental and cultural requirements are summarized, with a discussion on its uses as a cover crop and for forage, seed production, and on its enemies. Tables show the results of planting tests; comparative green matter yields of mat bean, cowpeas, and soy beans; and the composition of the mat bean plant and seed, and of alfalfa, cowpea, and soy bean hay.

Spraying and dusting of potatoes in Michigan, J. E. KOTILA and G. H. COONS (*Michigan Sta. Tech. Bul. 72 (1925), pp. 3–15, figs. 3*).—The merits of different spray and dust applications on potatoes were compared at the Upper Peninsula Substation during the years 1922–1924.

Hopperburn was very severe in 1922, and plats treated with Bordeaux mixture and with copper-lime dust made higher yields than the checks. The high cost of the dusting material made it uneconomical. Plats treated with Bordeaux made about 74 bu. per acre more than untreated plats and an estimated acre profit of $22.12 due to the spraying.

Fungus diseases and insect pests caused practically no damage in 1923 and 1924, and treated plats were not markedly superior to the untreated. The reputed stimulative effect of Bordeaux was not observed in seasons when parasites were not prevalent. The authors advise the continuation of the practice of spraying potatoes with Bordeaux mixture.

Potato production in Utah, G. STEWART (*Utah Sta. Circ. 58 (1925), pp. 5–63, figs. 24*).—This is a revision of Circular 40 (E. S. R., 41, p. 643).

Winter rye in North Dakota, T. E. STOA (*North Dakota Sta. Bul. 193 (1925), pp. 14, figs. 4*).—Rye and its uses, cultural requirements, varietal characteristics, and diseases are described briefly, and report is made of varietal and cultural trials at the station and substations. The information in general agrees with that noted earlier (E. S. R., 50, p. 34).

Dakold rye leads the varieties in winter hardiness and has been the most consistently high yielding rye for North Dakota. Minnesota No. 2, Wisconsin No. 12–19, and Dickinson No. 5 were also very hardy. N. D. R. No. 9, a larger seeded variety, is less winter hardy but yields well where it winters successfully. Rosen lacks hardiness and can not be recommended for North Dakota except where considerable winter protection is afforded.

[Investigations with soy beans in Illinois] (*Illinois Sta. Rpt. 1924, pp. 28–33, fig. 1*).—Manchu and A. K. soy beans were outstanding as seed producers in tests by J. C. Hackleman, while Virginia led in hay production. O. H. Sears found that inoculation is not a substitute for limestone, although it increases soy bean yields on acid as well as on limed soils. That the growth of soy beans on acid soil can be increased to a marked degree through the use of limestone was also shown. Investigation of nodule development in soy beans by Sears and T. E. Richmond demonstrated that no relation exists between the seed coat color of different soy beans and their susceptibility to nodule

bacteria infection. Low temperatures and soil acidity lead to variation in nodule development. The total weight of nodules probably is a better index of the effectiveness of the bacteria than the number of nodules on a plant. Soy bean nodule bacteria from various sources differ in their ability to fix atmospheric nitrogen in the roots of the host. Some soy bean varieties when inoculated apparently are more effective users of atmospheric nitrogen than others.

In inheritance studies with soy beans by C. M. Woodworth the normal leaf was dominant in crosses between normal and narrow leaf types. In certain progenies segregating for hilum color (black and brown) and flower color (purple and white), there appears to be complete correlation between these characters. Hybrid beans in some crosses showed heterosis during the season in which the cross was made. Current results of an experiment by Woodworth and L. A. Hunter made it seem possible to isolate lines that exceed the average in oil content and lines that are lower than average. Investigation by L. H. Smith and A. M. Brunson has shown that a soy bean of high-oil or high-protein content will be produced by the choice of existing high-oil or high-protein strains and perhaps by isolation of pure line strains within the variety and not by continuous selection.

Production of sweet-potato seedlings at the Virgin Islands Experiment Station, J. B. Thompson (*Virgin Islands Sta. Bul. 5 (1925), pp. 14, pls. 3, figs. 2*).—Breeding work with sweet potatoes at the station is reported on, and the flowers, seed and seeding habits, and propagation methods are described. A simple classification key, with groupings based upon color of root and midrib, vine length, and leaf pattern, facilitates quick comparison of the seedling varieties. A standard method comparing the yield of the seedling with the mean of the parent yield and that of the progeny is used to determine the productivity of a seedling.

Breeding work with sweet potatoes in progress since 1922 has given rise to more than 1,800 seedlings, of which 1,100 reached maturity. About 240 varieties have been grown for two or more years. Seed in large quantities matured in St. Croix in 1922, 1923, 1924, and 1925. Production of flowers and seeds varies with the variety. Natural crossing occurs readily, insects undoubtedly being an important factor. Good untreated seed germinates very irregularly, even when sown under favorable climatic conditions. The first seeds germinate in 2 to 4 days after planting, and the others at any time within 100 days. Germination has been improved and hastened by scarifying the seed. It was found that sweet potato seed can be stored under St. Croix conditions for at least 14 months without deteriorating.

Plants bearing more than two cotyledons were found frequently, and as many as four cotyledons were observed. The fleshy interior of the roots of seedling varieties in many cases was red in color, the shade varying from a light mauve to a dark magenta. This internal coloring appears to be uniform among the roots of the same hill, and may possibly be eliminated through selective breeding.

Results of wheat variety tests on the Purdue-Vincennes Experiment Farm, A. Goss (*Indiana Sta. Prog. Rpt. 1 (1925), pp. 6, figs. 3*).—Purkoff and Michigan Amber have led the winter wheat varieties compared during 1924 and 1925 on soil of rather low fertility. Purkoff outyielded Michikoff on fertile as well as on poorer soil and showed promise in other trials.

Milling and baking quality of wheat (*Nebraska Sta. Rpt. [1924], pp. 24, 25*).—The Nebraska wheat crop of 1924 averaged slightly lower in protein or gluten content than the crops of 1922 and 1923 and slightly higher in baking

quality. Apparently quality in gluten is of great importance as well as quantity. The earlier maturing varieties in the 1924 crop, especially Nebraska No. 28, showed higher protein contents and better baking qualities than the others.

The surveys during 1922–1924 seem to indicate definitely that in baking qualities the Nebraska wheats vary considerably in different localities. Marked variation from one year to another may occur within the same locality. High protein content frequently failed to correlate with the high baking quality shown by Nebraska wheats, due to differences in gluten quality or to a factor unknown. There is no correlation between commercial grade and quality. The higher protein winter wheats from the more arid regions of western Nebraska are often poorer in baking quality than the winter wheats of eastern and southern Nebraska. Kanred and Turkey wheats are about equal in baking quality. In general, the baking quality seems to be determined more by soil conditions as influenced by such factors as climate and weather and by cultural practices than by inherent varietal characteristics.

HORTICULTURE

[**Horticultural investigations at the Florida Station**], R. W. Ruprecht, H. Mowry, and G. H. Blackmon (*Florida Sta. Rpt. 1924, pp. 50, 51, 52, 57–62, 63–72, 74, figs. 2*).—Analyses of fruit taken from trees in various plats of a qualitative phosphorus fertilizer experiment showed no differences in yield or in acid or sugar contents that could be attributed to the form of phosphorus used. In a quantitative test of potash, grapefruit trees fertilized with 3 per cent material outyielded those fertilized with 10 per cent. On the other hand, oranges yielded slightly better with the 10 per cent treatment. Analyses of fruits from the various plats for acidity and sugars showed no perceptible differences. Observations at Round Lake upon frost-injured Satsuma orange trees showed no differences correlated with fertilizer treatment.

Observations upon the fruit-bearing habits of tung oil trees showed the presence of marked individual variations, one very fruitful tree bearing as high as 11 fruits in a single cluster. Propagating tests with tung oil trees indicated the possibility of using both budding and grafting. Cuttings, however, rooted slowly and with difficulty. Japanese persimmons grafted on native stocks were usually short lived. In connection with variety tests of grapes, pears, berries, etc., there are listed a large number of ornamental and fruit-bearing plants now under trial on the station grounds.

A test of a commercial paper as a mulch for newly planted pecan trees was abandoned because of the interference of the paper with normal cultural operations.

[**Horticultural investigations at the Illinois Station**] (*Illinois Sta. Rpt. 1924, pp. 120–126, 129–132, 133, 136–138, 140–147, 149–155, 158–162, 163, 164, figs. 4*).—Apple fertilizer studies conducted by W. A. Ruth at Neoga showed that cultivation and the addition of nitrogen in the form of nitrate of soda, cowpeas, or manure is an essential practice in the orchards of southern Illinois. Mulch with fertilizers, though not equal to cultivation and fertilizers, gave favorable results and is recommended, especially for soils subject to erosion. At Olney, Jonathan and Grimes trees, fruiting abundantly for the first time in 1923, failed to respond to fertilizer treatment, all the trees going into a condition of alternate production despite the liberal use of nitrate of soda.

Fruit breeding studies conducted by C. S. Crandall and G. E. Fager involved a study of more than 20,000 apple seedlings, representing over 600 parental combinations. Detailed observations on the seedlings showed that characters are not transmitted in a clearly defined manner, and that rarely do valuable features of the parents appear unchanged in the progeny. Peach breeding studies have resulted in the isolation of 238 selected seedlings now under final trial.

Studies by Ruth and V. W. Kelley upon methods of pruning newly set apple trees are again discussed (E. S. R., 54, p. 138). The confining of the growth to three branches without a central leader tended to reduce growth, as indicated by trunk diameter increments. That peach yields may be generally increased by tillage and fertilizers was shown by Ruth in work carried on near Olney. Cultivation alone increased yields 125 bu. per acre, cultivation plus fertilizer 220 bu., and cultivation, fertilizer, and cowpea cover crop 233 bu. above similar untreated trees.

Ruth and Kelley report that, while spreaders are of undoubted value in increasing the covering capacity of sprays, there is sometimes less spray retained on the leaves than in the absence of spreaders. This fact is especially true with foliage naturally retentive of sprays. Covering and amount of spray retained were also affected by the amount of hygroscopic water present on the sprayed surface; for example, peach twigs were covered more easily on foggy than on clear days.

As a result of extended tests, A. S. Colby presents a list of varieties of small fruits suitable for planting in Illinois. Raspberry breeding activities by Colby and A. C. Vogele have resulted in approximately 1,300 seedlings, some of which are deemed quite promising. Grape pruning studies, conducted by Colby and Vogele, are again discussed (E. S. R., 54, p. 140). European grape varieties grafted on native roots and afforded winter protection produced satisfactory crops of fruit. Certain American varieties of grapes when held at from 31 to 33° F. kept well into January. As a rule, red grapes were better keepers than black or white varieties.

Fertilizer studies with vegetables, conducted by J. W. Lloyd and C. S. Dale, showed astonishing results with early planted short-season species, such as spinach, leaf lettuce, and early beets, the fertilized plats arriving at market maturity long before the controls. Studies by Lloyd indicated the value of chemicals as supplements to animal manures in greenhouse fertility. Lettuce responded favorably to both nitrate of soda and dried blood. However, applications of acid phosphate, either alone or in combination with nitrate of soda, were injurious to lettuce. Increased lettuce yields followed steam sterilization, and are thought due to increased availability of nutrients following the treatment. Tomatoes succeeding the lettuce were not injured, but greatly benefited by acid-phosphate applications. A combination of nitrate of soda and steamed bone was found especially favorable for the tomato. Outdoor experiments in the use of chemicals as supplements for manure showed the importance of phosphorus in tomato and muskmelon culture. Every combination containing commercial phosphorus was substantially more effective than the same treatment without phosphorus. That naturally fertile soils may be benefited by fertilizers was indicated in greatly increased yields of muskmelons and tomatoes following the broadcasting of 10 tons of manure per acre. Results attained from the use of winter vetch as a source of humus and nitrogen for muskmelons, tomatoes, and sugar corn were not such as to warrant abandoning the use of manure.

A study by Lloyd of the use of fertilizers and irrigation in pepper growing, indicated that the condition of the plants at the time of setting in the field and

the variety were more important considerations than variations in fertilizer treatments. Sweet Mountain was the most productive variety tested. In investigating various factors concerned in the productivity of Lima beans, Lloyd found that soil moisture was the most important, irrigated plants outyielding controls by 44 per cent. The addition of nitrate of soda to irrigation gave 51 per cent increase, and inoculation alone 19 per cent increase. The Dreer Bush was decidedly the most productive of five varieties tested.

Studies by C. B. Sayre of factors affecting the growth of forced rhubarb showed 59° F. to be the optimum temperature for high yields and good-colored stalks. Color was apparently controlled by temperature, lower temperatures being associated with increased color. Contrary to commercial opinion, watering markedly increased yields without appreciably lessening color. Four-year-old roots produced more and better-colored stalks than did 1-year roots.

Work conducted by Sayre upon the forcing of witloof chicory indicated that a temperature of from 65 to 70° is most favorable, that medium-sized roots are best, that no rest period is required preceding forcing, that freezing is injurious to the roots, and that forcing in the field is not a feasible practice. A study, conducted by H. W. Anderson, upon watermelon wilt resistance, showed that the Conqueror variety, although resistant, is unsatisfactory in respect to quality, productivity, and time of maturity.

Plant selection studies with roses, carried on by F. F. Weinard and S. W. Hall, are deemed to indicate the possibility of isolating productive strains. The abnormal curling of carnation petals was eliminated by the selection of normal plants. A comparison of acid phosphate and steamed bone as sources of phosphorus for roses and carnations showed a slight superiority in favor of acid phosphate for roses. The withholding of both acid phosphate and bone meal resulted in lowered yield. Carnations, however, showed little response to additional phosphorus in either form. That the beneficial effects of acid phosphate lies in its phosphorus rather than sulfur content was indicated in a greater production of roses on acid phosphate than on gypsum or bone plus gypsum plats. That the annual renewal of soil favors carnation production was indicated in a gradual decline in yield per plant occurring in soils held over for several seasons. Studies by Weinard upon gladiolus forcing showed the need of a definite rest period preceding forcing, the average date of flowering not being advanced by planting before the middle of January. Weinard and H. B. Dorner, working with rose stocks, fonnd that plants grafted on *Rosa odorata* tended to outyield those on *R. manetti*. As determined by Weinard and J. Hutchinson, orchid seed germination was favored by the use of a sterile nutrient medium.

[Horticultural investigations at the Kentucky Station] (*Kentucky Sta. Rpt. 1924, pt. 1, p. 27*).—Of a total of 196 bu. of apples picked from a variety orchard, 72 bu. were harvested from heavily pruned and 124 bu. from a practically equal number of lightly pruned trees, indicating the marked advantage of light pruning. Although in their eleventh year, the Gravenstein and Northern Spy trees have not commenced bearing. Among winter varieties, the Stayman Winesap is deemed the best on account of its regular bearing, the vigor of the tree, and the high quality of the fruit.

[Horticultural investigations at the Pennsylvania Station] (*Pennsylvania Sta. Bul. 196 (1925), pp. 15, 16, 26–28, figs. 2*).—Progress in various investigational activities is briefly noted, as in the preceding report (E. S. R., 52, p. 232). Experiments reported by R. D. Anthony on apple trees growing in a nonleguminous sod and submitted to various treatments continued to show the value of nitrogenous materials, especially when applied about two weeks

before blossoming. In a soil low in phosphorus the combination of acid phosphate and nitrogen, by virtue of its stimulating effect on the cover crop, finally, after 15 years, effected a noticeable difference in tree growth (E. S. R., 53, p. 439). In another part of the same orchard, where cover crop growth was satisfactory, no gain was obtained from the use of fertilizers.

As reported by Anthony, storage studies showed the value of large doors located in opposite ends of bank storage cellars as means of insuring adequate ventilation. In shaded cellars, the temperature of the soil was found to be a very important factor, modifying warm or cold outdoor conditions and allowing the safe intake for ventilating purposes of a certain amount of air below freezing temperature.

In working with one-year apple trees, F. N. Fagan found that disbudding is a satisfactory method of developing strong, well-placed framework limbs. As compared with pruning, disbudding did not reduce the number of leaves to any appreciable extent nor diminish the total terminal branch length.

Reporting on eight years' results of a rotation experiment involving the tomato, cabbage, and early potato, W. B. Mack states that, on the soil utilized, phosphorus was found to be the most essential element for cabbage, although nitrogen and potassium gave profitable response. Even in the maximum quantity used, namely, 1,250 lbs. of acid phosphate in a complete fertilizer mixture of over 2,000 lbs. per acre, profitable returns were recorded. In studying the effect of missing plants it was found that the neighboring cabbage plants failed to make up any significant part of the loss.

Observations by C. E. Myers on selected strains of Penn State Ballhead cabbage showed considerable variability in resistance to blackleg. Selection has resulted in the isolation of a vigorous, productive type of rhubarb, characterized by very large, fairly well-colored stalks.

Studies by J. P. Kelly upon fasciation in the stems of phlox led to the conclusion that this is an inherent characteristic, not due to outside agents such as insects, etc. Further work by J. B. Hill in the breeding of Digitalis resulted in successful reciprocal crosses between *D. ambigua* and *D. purpurea*. As proof of the self-fertility in certain F_1 Digitalis species hybrids, F_2 progeny was secured from four breeding lines. Sesquihybrids of *D. ambigua*×*D. ferruginea* and *D. ambigua*×*D. lanata* were obtained by back-crossing F_1 hybrids to the parental forms.

Spreaders for spray materials, and the relation of surface tension of solutions to their spreading qualities, R. H. Robinson (*Jour. Agr. Research* [*U. S.*], *31* (*1925*), *No. 1*, *pp. 71–81*).—A comparison of the surface tension values and spreading qualities of various materials of use or possible use as spreading agents in orchard sprays showed no conistent relationships. Substituting for the plant surface a film of mineral oil of specific gravity 0.869 at 20° C., the author found that the interfacial tension values were not proportional to the spreading properties of the various materials. Obtaining similar results with other oils, the author concludes that oils can not be substituted for actual plant surfaces in order to obtain values upon which to base the spreading qualities of a solute. Among other factors influencing spreading are the solvent action of the spreader on the surface to be covered, the rapidity with which static equilibrium is reached, and the formation of plastic solids at the interface. The effectiveness of the spreader was found to depend also on a number of variables, such as type and age of the surface, pressure of the application, and climatic conditions.

Skim milk and its products, when neutralized with hydrated lime, were found to be excellent substitutes for commercial casein-lime materials. In lead

arsenate sprays the amount of material adhering to the leaf was practically the same with or without the spreader, the advantage of the spreader consisting in better distribution.

Growth of lettuce as influenced by reaction of culture medium, J. W. Crist (*Michigan Sta. Tech. Bul. 71 (1925), pp. 25, figs. 3*).—Carefully conducted investigations showed that, contrary to a general impression among commercial growers, the Grand Rapids Forcing variety of lettuce is tolerant to a high degree of soil acidity, and is injured rather than benefited by large applications of lime.

Data taken on the effects of graduated applications of hydrated lime upon lettuce plants growing in a soil mixture of acid muck and drift sand, fertilized sparingly with acid phosphate and muriate of potash, showed yields inversely proportionate to the amount of lime used. The highest yield, that of the nonlimed unit, was less than one-third that of a comparable unit of neutral potting soil. Finding that the absolute calcium oxide in the plants varied in the opposite direction to the amount of lime applied, the author suggests the probability that the lime exerted injury through the function of calcium in decreasing the permeability of the plant membranes involved in the processes of absorption and translocation.

In the second experiment, in which heavy applications of acid phosphate were used in connection with lime treatments upon lettuce growing in a highly acid soil, fertilized liberally with nitrate of soda and potassium chloride, those plants receiving acid phosphate with or without lime made substantial growth, suggesting to the author that acid phosphate exerted a marked influence in increasing the permeability of the root membranes to nutrient ions. That lime reduced permeability even in the presence of abundant acid phosphate was shown in higher yields on the acid phosphate unit than on the acid phosphate plus lime units.

Using a soil medium naturally containing considerable phosphorus, it was found again that applications of lime beyond from 25 to 33.3 per cent of the total lime requirement consistently decreased the size of plants and the amounts of calcium, phosphorus, iron, and aluminum absorbed. Successive determinations of lime requirements of the soils showed a steady decrease until the plants were more than half matured, following which time, without exception, a rise was recorded.

Observations upon lettuce plants growing in carefully environed water cultures, having initial pH values of 3, 4, 5, 7, 8, and 9, showed that acidity of the value pH 5 is most favorable to the growth of lettuce. The degree of acidity represented by pH 3 was intolerable, and at pH 9 the adverse effects of alkalinity were evidenced in high mortality, root injury, and chlorosis. Fatal chlorosis was successfully prevented by supplying iron at successive intervals when needed, and in extreme cases by painting the leaves with a weak solution of ferric chloride.

In general summation, the author points out that apparently nutrient conditions exert a profound influence upon the permeability of the absorbing organs of the plant, determining in a large measure whether it shall utilize or store its elaborated foods, whether it shall remain vegetative or become reproductive.

Studies in apple storage, O. M. Morris (*Washington Col. Sta. Bul. 193 (1925), pp. 5–44, figs. 16*).—Following a brief discussion of the pressure tester and its development as a means of determining the maturity of deciduous fruits, the author reports upon the results of miscellaneous studies on factors affecting the storage life of apples.

Pressure determinations repeated at frequent intervals upon deep red, light red, and uncolored Jonathan apples, although showing a gradual decline in resistance in all lots, gave consistently higher readings in the case of colored fruits. An unexpected rise in readings on Rome Beauty apples toward the close of their storage life is attributed to increased resistance of wilted fruits. Although pared fruits gave more uniform readings than unpared, there was found a distinct correlation between increased resistance due to color or advanced maturity and keeping quality. On hot, dry days in the fall, attached Jonathan apples wilted sufficiently to affect pressure readings materially.

In one lot of Jonathans examined, after 60 days' storage at 40° F., there were found 37, 29, and 8 per cent of decay at the point of indentation for ⅝-, ¾-, and 1-in. plungers, respectively, indicating the importance of using a broad, blunt plunger, which will not readily break the skin.

Records taken on the keeping quality of apples harvested from trees maintained by irrigation in wet, medium wet, and dry soils indicated that the keeping quality is not directly modified by soil moisture provided the same is kept within the limits of the well-being of the tree. Irrigation, however, by influencing the size and color of fruits, had an indirect effect on keeping quality. Observations upon Jonathan apples showed that the period of best eating quality in this variety lies between pressure-test readings of 14 and 19 lbs., as measured by a ⅛-in. indentation of a 1-in. plunger. That delay in storing during warm weather may be decidedly destructive to keeping quality was indicated in the rapid decline of Jonathan and Rome Beauty apples in 40° common storage after having been held for 24-, 48-, and 96-hour periods in a warm chamber whose temperature ranged between 75 and 80°.

The nutrient requirements of the strawberry, R. E. Loree (*Michigan Sta. Tech. Bul. 70 (1925), pp. 3–29*).—Working with Senator Dunlap strawberry plants growing in pots containing low-quality sand, fertilized with various nutrients applied singly and in combination, the author found that nitrogen was the chief limiting element to both growth and production. Alone, or in combination with phosphoric acid and potash, nitrogen increased the total yield in every instance. The largest yields of fruit were secured from plants fertilized at three times, in the spring and summer of the growing season and in the spring of the fruiting year. Using equal amounts of the same nutrients, summer applications were more effective in respect to yield and growth than were those applied in the spring of the fruiting year.

That fruit-bud differentiation is determined in the summer preceding fruiting was indicated in the fact that fertilizers applied in the spring of the bearing year had no effect on the number of clusters or the flowers per cluster. However, applications of nitrogen in the spring of the bearing year influenced, to some extent, the proportion of fruits to set and the size of the berries. The response to spring applications in the fruiting year was greatest in plants grown under low nutrient conditions the preceding season. The proportionate size of root and top growth was materially affected by the nutrient conditions, the roots diminishing and the tops increasing with an increasing nutrient supply in the soil. When used alone, phosphorus had no apparent affect on growth, but in combination with nitrogen increased both growth and yield above nitrogen alone.

Chemical analyses of plants with the various treatments showed the unfertilized and spring-treated plants to be lower in nitrogen, phosphoric acid, and potash, and higher in the percentage of carbohydrates than were the summer-treated plants. Variation in the nitrogen content of plants at the time of fruit-bud differentiation had a greater effect on yield of fruit than did varia-

tions in carbohydrate content. Plants combining high nitrogen and high carbohydrate contents were the most productive. Fruitfulness in the strawberry was not determined by the size of the crown, but rather by the number of flower clusters and the number of blossoms which set and developed into fruit.

The fruiting habits and pruning of the Concord grape, N. L. PARTRIDGE (*Michigan Sta. Tech. Bul. 69* (*1925*), *pp. 3–39*).—Records taken over a period of four years in experimental pruning plats established in three Concord vineyards located on different soil types indicated that, although certain fundamental principles underlie the pruning of the grape, the severity of the pruning must be based largely on the vegetative vigor of the individual vine and the fertility of the soil. Except in rare cases of overvegetative vines, fruitfulness in a given season was indicated by the weight of prunings removed the preceding winter. Under Michigan conditions vigorous vines trained according to the 4-cane Kniffin system can support from 8 to 12 buds per cane. Weakly vegetative vines should carry fewer buds per cane, and overvegetative vines more canes per plant, rather than more buds per cane.

Correlating measurements of diameter of canes with production, it was found that the diameter between the fifth and sixth nodes was a reliable index to fruitfulness, the coefficient of correlation between diameter at this point and fruitfulness being $+0.55\pm0.03$ in one of the vineyards. Canes whose diameter at this point ranged between 0.25 and 0.30 in. were most productive. The region of maximum production in canes was found to vary slightly from year to year in response to environmental influences of the preceding and current seasons. Internodal length, although not so positive an index to fruitfulness as was the diameter of the cane, was found quite reliable, especially when the distance between the fifth and sixth nodes was considered. An internodal length range in this region of from 5 to 8 in. indicated greater fruitfulness than did either lesser or greater lengths.

Although data on heavy, medium, and lightly pruned vines showed no significant differences in total yield during four years, an important benefit accrued from pruning in respect to the weight of bunches and the vigor of new cane development. Both the heaviest bunches and the largest number of bunches per node were usually associated with those nodes and canes producing the largest yields per node. Although canes arising directly from the trunk or from short arms were usually somewhat more productive than similar canes arising from long arms, the difference was not sufficient to warrant the selection of obviously inferior canes merely because of their location. Canes arising from young wood were usually more productive than those from older wood. As a means of overcoming a tendency in certain vineyards to biennial bearing, the author recommends heavier pruning in the winter preceding heavy fruiting rather than lighter pruning in the winter before the off year.

[Grape pruning at the Nebraska Station] (*Nebraska Sta. Rpt.* [*1924*], *p. 17*).—A comparison of cane and spur-pruned vines, both groups reduced to approximately 60 buds per vine, was to the advantage of the cane-pruned plants in number of productive buds and in the number and size of the clusters.

[Winter hardiness of citrus stocks], H. MOWRY (*Florida Sta. Rpt. 1924, pp. 56, 57*).—The author reports that citrus plantings on the station test grounds were considerably damaged by the cold of January 5, 1924. This offered an opportunity to study the degree of hardiness of rootstocks, and it is reported that none of the *Citrus trifoliata* or its hybrids showed any appreciable degree of injury at 22° F., either in the nursery or in the grove. Rough lemon and grapefruit stocks were killed to the ground, sour orange

in most instances was severely damaged, while bittersweet on higher ground showed little injury, and Cleopatra mandarin was next to *C. trifoliata* in the freedom from injury.

Preliminary report on colloidal clays as emulsifiers for mineral oils used in spraying citrus groves, W. W. Yothers and J. R. Winston (*Jour. Agr. Research* [*U. S.*], *31* (*1925*), *No. 1, pp. 59–65*).—Certain difficulties, such as incompatibility with hard deep-well water and with lime sulfur, occurring in soap emulsions of mineral lubricating oils, led to the use of various stabilizers, namely, glue, casein, milk powder, flour, cornstarch, laundry starch, and water glass, materials which, however, added a further complication, namely, that of fermentation, provided any considerable period elapsed between the preparation and use of the spray. Experimenting with kaolin, fuller's earth, and other colloidal clays as substitutes for soap, the authors found that sprays made from these materials were practically as effective as soap emulsions in combating insect pests of citrus trees and were no more likely to cause spray injury. In addition the clay emulsions have the decided advantage of mixing with any water or desired spray combination without the use of any special treatment. Furthermore, sprays made with colloidal clays keep indefinitely. In cost, the clay emulsions were cheaper, both in respect to material and labor, than the soap sprays.

FORESTRY

Laboratory tests on effect of heat on seeds of noble and silver fir, western white pine, and Douglas fir, J. V. Hofmann (*Jour. Agr. Research* [*U. S.*], *31* (*1925*), *No. 2, pp. 197–199*).—Germination records taken in the nursery upon seeds which had been subjected to dry heat of temperatures varying from 100 to 300° F. and moist heat of temperatures ranging from 100 to 240° showed the seed of Douglas fir and western white pine not only to be highly resistant to heat but also to be much more resistant than that of silver and noble firs. In general moist heat was more destructive to viability than was dry heat. Detailed notes are included upon the effect of the various temperatures upon the appearance and behavior of the seeds.

Best time for sowing silver fir in the nursery, J. V. Hofmann (*Jour. Agr. Research* [*U. S.*], *31* (*1925*), *No. 3, pp. 261–266, figs. 3*).—Records taken at the Wind River Nursery, Carson, Wash., upon beds of silver fir (*Abies grandis*) sown at different times showed that late fall, as compared with spring sowings, resulted in conspicuously better germination, higher survival, and stronger plants, which matured their buds earlier in the autumn. The optimum period of germination in fall-sown beds occurred in late April and early May, as compared with June and July for spring-sown beds. In the spring-sown beds the best success was secured with late April and early May sowings. Records taken in the various beds indicated that a soil temperature of 70° F. or higher to a depth of 6 in. is most favorable to germination. The author points out that there is always the possibility of loss by damping off in fall-sown beds.

Girdling as a means of removing undesirable tree species in the western white pine type, D. R. Brewster and J. A. Larsen (*Jour. Agr. Research* [*U. S.*], *31* (*1925*), *No. 3, pp. 267–274*).—Attempts to eliminate, by girdling and poisoning, western hemlock (*Tsuga heterophylla*) and white or silver fir (*Abies grandis*) trees occurring frequently in western white pine stands in northern Idaho and Montana, and deemed undesirable because of the liability to heart

rot before reaching maturity and also because of their intrinsically lower timber value, led to inconclusive results, the treated trees often surviving long enough to produce a heavy crop of seed, thus defeating the purpose of their removal. Of the several methods used in the investigation, girdling with an ax notch was the most effective. Girdling in the spring and early summer seemed sligbtly more effective than similar treatment in late summer or winter. Although there was found some indication that girdling stimulated seed production in the western hemlock, the data were not sufficient to be conclusive.

Weather conditions and forest fires in California, S. B. Show and E. I. Kotok (*U. S. Dept. Agr., Dept. Circ. 354* (*1925*), *pp. 24, figs. 9*).—Attempts to establish the relationship between weather and forest fire hazards in California, where from June 10 to September 30 rainfall conditions are such that fires will start and spread readily, indicated the reliability of short-term forecasts, because of the frequent occurrence of brief periods during which fires spread with extraordinary rapidity. Analysis of weather records and fires showed that these brief periods of extra hazard are characterized by very low relative humidity and high wind velocity. The rate of evaporation, found of only fair reliability as an indicator of fire danger and rate of spread, is deemed of value in localizing regional forecasts. Relative humidity data are also placed in the same category.

DISEASES OF PLANTS

Report of plant pathologist, O. F. Burger (*Florida Sta. Rpt. 1924, pp. 84–113*).—The occurrence of coconut bud rot, from which *Phytophthora faberi* was isolated, is reported at Miami.

Work has been continued on citrus diseases, and it has been found that the organism which causes citrus canker can not persist long in ordinary soil, but laboratory studies showed that it retained viability for a considerable time in sterilized media, including soil, cloth, pine shavings, etc. Field experiments in the control of melanose by means of a Bordeaux mixture oil spray (E. S. R., 48, p. 849) were successful when applied at the proper time. The author claims that oil emulsions must follow treatment for melanose in order to control insect pests. It was demonstrated that scaly bark was carried on bud wood. An unusual type of withertip on grapefruit twigs in which there was a copious exudation of gum is reported.

The work with truck crop diseases conducted by G. F. Weber included investigations on the use of copper-lime dust for the control of downy mildew of cucumbers, variety tests of tomatoes for resistance to nailhead rust (*Macrosporium solani*), the successful control of *Corticium stevensii* on pear trees by the application of Bordeaux mixture, and spraying fig trees with Bordeaux mixture for the control of *Physopella fici*, which causes a rust and results in the defoliation of the trees. A downy mildew of wild millet is reported in several counties of the State.

A report of potato disease investigations conducted under the supervision of L. O. Gratz, enumerates diseases found during the year, and briefly summarizes experiments on spraying and dusting, varieties, source and strain tests, etc., for controlling diseases. Experiments on the relative efficiency of different numbers of applications and strengths of copper-lime dust gave inconclusive results. In several field trials, when comparisons were made with no treatment, increased yields were reported due to dusting. Considerable differences were found in the behavior of different varieties of potatoes in yield, as well as the same varieties when obtained from various sources.

Citrus-blight investigations under the charge of A. S. Rhoades are summarized. This disease is said to have been known for approximately 50 years. It occurs on all types of soil and affects all varieties of citrus, regardless of stocks. A characteristic of blighted trees is the abnormally abundant bloom, and this trait is said to be transmitted through buds and grafts. Blighted twigs usually fail to propagate when used as cuttings. Studies were made of all parts of blighted trees without finding any definite cause of the disease.

A list of plant diseases observed in Florida is given as a supplement to the list reported previously (E. S. R., 52, p. 241).

Department of botany and bacteriology, D. B. Swingle (*Montana Sta. Rpt. 1924, pp. 25–29, figs. 2*).—In a summary account of work carried on at the station, the author reports briefly on sunflower wilt, which is apparently influenced by weather and soil conditions. Notes are given on the degeneration diseases of potatoes, and it has been demonstrated that certain insects and diseased tubers are capable of disseminating these diseases. White spot of alfalfa, which has been under observation for several years, is described. When first observed a few plants here and there were seen that showed leaves, parts of leaves, or groups of leaves totally lacking in chlorophyll. Since first discovered, the disease has increased greatly, and it is said to occur in nearly all fields in the vicinity of Livingston and in several regions of central Montana. The cause of the disease is as yet undetermined. Poplar canker is said to have made its appearance in many parts of Montana, and investigtions have been carried on to determine the local conditions and methods of control.

Botany and plant pathology (*Pennsylvania Sta. Bul. 196 (1925), pp. 14, 15, 16–18, figs. 2*).—Investigations by H. W. Thurston were conducted on the sources of seed potatoes free from leaf roll and other so-called degeneration diseases. Fusarium wilt was found to be more virulent in some parts of the State than in others. Hydrated lime and ground limestone are said to be about equally valuable for the control of clubroot of cabbage, although ground limestone is somewhat slower in its action.

Experiments by E. G. Rex on the control of cabbage blackleg are said to indicate that long crop rotations give promise of control, but where such practices can not be adopted the application of corrosive sublimate 1–1,000 at the rate of 0.5 pint per plant at intervals of about 10 days throughout the growing season will give some relief. Planting disease-free cabbage seed where such can be secured is advised. Where none are available hot water or organic mercury treatment of seed is recommended. The hot water treatment is said to injure the seed to some extent, while the organic mercury compounds do not lower germination, but they were not quite so efficient in controlling the disease. It is claimed that their efficiency may be increased by using them at somewhat higher temperatures (40 to 50° C.) for 30 minutes.

Investigations by W. S. Beach on Lima bean diseases, crown rot of rhubarb, and some truck crop diseases caused by Sclerotinia and Botrytis are reported. Experiments with Bordeaux mixture, copper-lime dust, dry mix lime sulfur, and dusting sulfur gave no significant results when applied for the control of downy mildew of Lima beans, as the fungus was not very prevalent in 1924. The above treatments did not appear to control bacterial spots on leaves, and Bordeaux mixture and copper-lime dust are said to have slightly injured the foliage. Histological studies of the red spots on Lima bean leaves showed they were due to bacteria, probably *Bacterium viridifaciens*, the spots resembling to some degree those caused by *Ascochyta pisi*.

For the crown rot of rhubarb copper-lime dust is said to be preferred as a substitute for Bordeaux mixture. Selected roots planted in the field on April 6, 1925, were free from disease, and only about 2 per cent of them failed to grow normally.

In experiments for the control of truck crop diseases due to Sclerotinia and Botrytis, the application to the soil of concentrated formaldehyde solutions and wetting with a hose or by irrigation was found to be as efficient as treatment with a 1–100 dilution. Under favorable conditions for treatment, formaldehyde did not destroy all the sclerotia of *S. libertiana*. Organic mercury compounds used in amounts sufficient to kill the sclerotia also injured the lettuce plants.

R. C. Walton has continued investigations on the cause and control of frog-eye leaf spot of apple. All organisms isolated from such leaf spots were studied, and while occasional spots were produced through inoculation the results are not considered positive. Some of the new sulfur compounds are said to have given good control of frog-eye leaf spot, as well as other diseases.

Plant diseases (*Nebraska Sta. Rpt.* [*1924*], *pp. 27–29*).—In continuation of previous experiments by Peltier (E. S. R., 50, p. 446) a report is given of experiments on the physiological rust Form XXI. In general, the same results were secured as with Forms III and IX. Infection was obtained in three hours under optimum conditions, but the percentage of infected plants was increased by prolonging the period of incubation. Intensity of light was found not to increase infection, but the development of the rust was favored by the higher intensities of light.

In a previous publication (E. S. R., 51, p. 752) Goss reported on potato wilt and stem-end rot caused by *Fusarium eumartii*. Additional work has been undertaken on the physiology of the parasitism of several species of Fusarium, and data have been secured indicating that the species vary in the kind and amount of toxins produced, as well as in their ability to produce pectinase and amylase.

The results of a study of degeneration diseases of potatoes have been given by Goss and Peltier (E. S. R., 53, p. 351), and work has been continued with several types of mosaic, leaf roll, and spindle tuber to determine the rate of their spread, insect carriers, weeds as sources of primary infection, etc.

Growth of crops in soils differing with respect to freedom from disease (*Kentucky Sta. Rpt. 1924, pt. 1, p. 34*).—Comparisons were made of corn grown in pots in a virgin woods soil steamed and unsteamed, and in a soil from a continuous corn plat treated in the same manner. Better root systems are said to have been developed in the virgin soils and in the steamed cropped soil than in the unsteamed cropped soil. Root systems in the virgin soils and in the steamed cropped soil were largely free from lesions, clean, and white, while those in the unsteamed cropped soil were dark colored, badly rotted, and, to a considerable extent, made up of newly formed roots. The root systems were apparently free from disease in the virgin soils and in the steamed cropped soils. An application of fertilizer salts to the unsteamed cropped soils gave an increased growth of root systems, but no greater freedom from disease.

Sterilizing soil controls disease (*Ohio Sta. Bimo. Bul., 10* (*1925*), *No. 9, p. 169*).—According to R. C. Thomas, thorough steam sterilization of the soil for the control of rosette and drop of lettuce, nematodes on the roots of tomatoes, lettuce, and cucumbers, and wilt of tomatoes can be successfully applied in the greenhouse. The formaldehyde drench method treatment is said to be effective against rosette and drop of lettuce, but it is of slight value for the control of the wilts and nematodes of tomatoes and cucumbers.

Root-knot, J. R. Watson (*Florida Sta. Rpt. 1924, pp.* 77, 78).—Experiments for the control of root knot due to nematodes included soil fumigation and the growing of bunch velvet beans or cowpeas under constant clean cultivation.

In the experiments in soil fumigation calcium cyanide was substituted for the double application of sodium cyanide and ammonium sulfate, but no definite conclusions were drawn from the experiments. The sodium cyanide and ammonium sulfate method was given a thorough trial on a 2-acre celery bed in which sodium cyanide at the rate of 600 lbs. per acre was applied to the soil in solution, the beds irrigated, and ammonium sulfate at the rate of 900 lbs. per acre was scattered over the soil and disked in. From the standpoint of nematode control the test was not as conclusive as is desirable, but no injurious effects were noted on the celery plants.

Further tests with bush velvet beans and resistant varieties of cowpeas under constant clean cultivation were carried on, and the best results, as heretofore, were obtained with velvet beans.

A brief account is given of experiments carried on by R. L. Trigg, who found that an application of between 200 and 500 lbs. of sulfur to the acre resulted in a marked diminution in the number of nematodes in the soil and had a stimulating effect on plant growth. It was not found possible to eradicate nematodes completely, no matter how much sulfur was used, and applications in excess of 500 lbs. per acre had an injurious effect on the plants.

Bean varietal tests for disease resistance, R. D. Rands and W. Brotherton, Jr. (*Jour. Agr. Research* [*U. S.*], *31* (*1925*), *No. 2, pp. 101–154, pls. 3*).—The results are given of four years' testing of varieties of beans for resistance to anthracnose (*Colletotrichum lindemuthianum*) and bacterial blight (*Bacterium phaseoli*). Bacterial wilt (*B. flaccumfaciens*) was included in the 1923 studies, but the results are not considered conclusive as forming a basis for judging relative susceptibility. A total of 663 varieties and strains of beans were tested, of which 170 were of American and 493 of foreign origin.

Considering the varieties on which there was fairly conclusive evidence, 65 appeared to possess decided resistance to anthracnose or bacterial blight, 5 of them being resistant to both diseases, 27 to anthracnose alone, and 33 to bacterial blight alone. Six of the 27 anthracnose-resistant varieties proved practically immune to all known biologic forms of the fungus. The remainder were affected only to a slight extent. No very high degree of resistance to bacterial blight was observed in any variety of *Phaseolus vulgaris* tested. In the authors' experiments, tests were conducted on a large number of varieties of related species and genera of beans, and the results are briefly summarized.

The nitrogen constituents of celery plants in health and disease, G. H. Coons and L. J. Klotz (*Jour. Agr. Research* [*U. S.*], *31* (*1925*), *No. 3, pp. 287–300*).—A report is given of comparative analyses of healthy celery leaves and leaves attacked by *Cercospora apii* and *Septoria apii*, in which there was found in the leaves affected by these fungi a lower percentage of total nitrogen in the diseased than in the healthy tissue. Nitrites were found in the diseased material. A comparison of the nitrogenous compounds present showed in percentage of total nitrogen greater amounts of ammonia, humin, and protein, and less hydrolyzable, acid amide, basic, and nonprotein nitrogen in the diseased than in the healthy tissues. It is believed that these results can best be explained as due to the decomposition of the host by the parasite in a simple food relation. Attention is called to the importance of the nitrogen metabolism of parasitic fungi as a possible explanation of selective parasitism and as a point of attack in immunological research.

[Corn disease studies in Illinois] (*Illinois Sta. Rpt. 1924, pp. 43–46*).—As a means of preventing losses to the corn crop due to plant diseases, experiments were undertaken by W. L. Burlison, G. H. Dungan, and J. R. Holbert.

Diseased corn was grown in comparison with nearly disease-free seed, and the average of 3 years' results indicate that Diplodia rot caused a reduction in yield of 23 bu. per acre, scutellum rot 12, Fusarium 2.4, and Cephalosporium 1.4 bu.

In experiments on time of planting, early and medium-early plantings of nearly disease-free seed gave better yields than medium-late or late plantings. This was especially true in connection with seed susceptible to scutellum rot. With Diplodia infected seed late to medium-late plantings gave the best results.

In fertilizer tests it was found that while some diseases were controlled in this manner others were only slightly affected.

Rotation experiments, although not concluded, are said to indicate that a crop of small grain followed by clover in rotation with corn materially reduced losses from corn root rot.

Investigations begun by C. M. Woodworth and F. L. Winter are said to show that field and germination selections of a strain of corn have outyielded a strain developed by ear-to-ear breeding. Experiments which included hybridization and selection for the development of disease-resistant strains of corn are said to have yielded a number of selfed lines that were being tested for resistance of corn rots.

Corn root-rot studies (*Kentucky Sta. Rpt. 1924, pt. 1, pp. 32, 33*).—Studies were continued to determine the effect on yield of selecting the smoothest and roughest ears from a lot of properly cured seed ears. Beginning with a rough strain, and selecting the roughest and smoothest ears, the smooth outyielded the rough by 39 per cent in 1922; 13 per cent in 1923; and 9.44 per cent in 1924. The smooth ears outyielded the intermediate ones by 1.5 per cent. It is claimed that soaking seed for 20 hours in one part quicklime to four parts of water and then treating them for 15 minutes in a 1 to 1,000 solution of corrosive sublimate resulted in marked stimulation in germination and 93 per cent control of seed-borne organisms. Limewater alone had no effect in eliminating *Fusarium moniliforme* from corn seed. A warm formaldehyde solution (1:250 at 40° C.), in which seed were soaked for 25 minutes, was found very effective in ridding seed of surface organisms, although the treatment was not effective against *F. moniliforme* in corn seed.

Texas root rot disease (*Texas Sta. Rpt. 1923, pp. 19–21*).—The results of seven years' experimentation and observation on Texas root rot of cotton are given. The disease has been definitely proved through artificial inoculatons to be caused by *Phymatotrichum omnivorum*. Much of the data reported has been previously presented (E. S. R., 50, p. 45).

Further studies on the overwintering and dissemination of cucurbit mosaic, S. P. Doolittle and M. N. Walker (*Jour. Agr. Research* [*U. S.*], *31* (*1925*), *No. 1, pp. 1–58, pls. 6, fig. 1*).—In continuation of previous accounts of investigations of cucurbit mosaic (E. S. R., 49, p. 646), the authors present data on the transmission of the disease, overwintering, etc.

It is claimed that the disease does not persist in the soil, and probably is not carried by cucumber, squash, muskmelon, and pumpkin seeds. No evidence was obtained to indicate that the striped beetle (*Diabrotica vittata*) is an agency in overwintering cucurbit mosaic.

Mosaic was found to be transmissible through the seed of the wild cucumber, and the disease was transmitted from this host to the cultivated cucurbits by the cucumber aphis (*Aphis gossypii*), the striped beetle (*D. vittata*), and

the 12-spotted beetle (*D. 12-punctata*). The striped beetle is said to be the chief agency in transmitting the primary infection from the wild cucumber to the cultivated cucurbits.

Surveys of the principal cucumber-growing districts in Wisconsin and northern Illinois are said to indicate that the wild cucumber is an important factor in overwintering mosaic. In addition, it appears to be carried over in the milkweed (*Asclepias syriaca*), the pokeweed (*Phytolacca decandra*), and also in the roots of catnip (*Nepeta cataria*) and certain perennial species of Physalis.

Cross-inoculation experiments with plants of the Cucurbitaceae have shown that all species tested, with the exception of those of the genus Citrullus, are susceptible to mosaic. Infection was produced on plants representing 11 genera, including 23 species and 96 horticultural varieties. Successful cross inoculations were also made from mosaic cucumbers to *Martynia louisiana*, pigweed (*Amaranthus retroflexus*), and pepper (*Capsicum annuum*).

The authors claim that pepper plants may be infected with tobacco mosaic and the disease then transmitted from them to either tobacco or cucumber. Similar results were obtained from pepper plants inoculated with cucurbit mosaic. This is believed to indicate that the infective principle of tobacco and cucurbit mosaic are intertransmissible.

Comparative susceptibility of onion varieties and of species of Allium to Urocystis cepulae, P. J. Anderson (*Jour. Agr. Research [U. S.], 31 (1925), No. 3, pp. 275–286*).—The results are given of a test of 54 varieties of cultivated onions to determine their susceptibility to onion smut as a basis for experiments on crossing and selection for disease resistant strains.

Of the varieties tested, 25 were secured from American seed houses, and 29 were from Europe. No significant degree of immunity to smut was shown by any of the varieties.

Tests were also made of 39 species of Allium. Eight seemed to be immune to smut, and 31 showed differing degrees of susceptibility. Thirteen species seemed very susceptible, and they are considered in the same class as the common onion. Smut occurred in the cotyledons of 13 more species but did not kill the plants or occur in the true leaves. In 5 other species it occurred in the cotyledons and killed many seedlings at that stage, but it did not appear in the true leaves. Smut was not found to occur in any species which reproduce by bulblets.

U. cepulae is considered by the author as distinct from all other species of the genus which have been reported on other members of the genus Allium.

A study in degeneracy in potatoes (*Nebraska Sta. Rpt. [1924], pp. 30, 31*).—A preliminary report is given of a study of spindle tuber, which is said to be one of the most conspicuous of the so-called degeneration diseases of potatoes in Nebraska. That the disease is transmissible was shown by tuber grafts and its occurrence in unprotected plants in the field. Plants protected from insect visits as early as 10 days after emergence above the soil became infected. No evidence was found to indicate that the disease was transmitted from plant to plant through the soil.

Steam and chemical soil disinfection, with special reference to potato wart, N. R. Hunt, F. G. O'Donnell, and R. P. Marshall (*Jour. Agr. Research [U. S.], 31 (1925), No. 4, pp. 301–363, pls. 2, figs. 3*).—The authors give an account of studies made to determine whether the potato wart fungus *Synchytrium endobioticum* could be eradicated from infested soils. The studies included the effect of steam and chemical soil treatments on the occurrence

of potato wart, temperature changes occurring in soil under a steam pan, penetration of soil fungicides, and potato growth following chemical soil treatments.

It was found that infested soil could be sterilized by heat or chemicals. The steam pan sterilization was effective, but slow and expensive. Of 22 chemicals tested, 14 produced wart-free plats. The successful chemical treatments included bichloride of mercury, chloride of lime, copper sulfate, sodium carbonate, sodium fluoride, and sulfur applied dry; kerosene and crude oil used undiluted; and bichloride of mercury, Bordeaux mixture, cleaning solution, formaldehyde, lime sulfur, sodium chromate, and commercial weed killer applied in liquid form. The cost of the treatments varied from $220 per acre for sulfur to $1,900 per acre for bichloride of mercury in various combinations. The steam pan treatment, if prolonged sufficiently to become effective, is estimated to cost at least $1,500 per acre.

In studying the temperature changes occurring under the steam pan, it was found that heat penetrated the soil rapidly during the period of steaming, but when the steam was turned off the heat penetrated rather slowly. In steam pan treatments to exterminate the potato wart organism, it was necessary to heat the topmost 8 in. of soil to approximately 100° C. Doubling the steam pressure was found to almost double the rate of penetration of heat in the soil under the steam pan.

In studying the rate of penetration of the different chemicals, the formaldehyde rate was equal to that of the water carrying it in the solutions. Chloride of mercury and copper sulfate both penetrated slowly, but their action was greatly accelerated by the addition of sodium chloride. The penetration of kerosene was variable, depending upon the water content of the soil.

The effect of the different treatments on potato growth showed that when heavy chemical treatments were applied to sterilize soil, their toxicity, their alteration of the mechanical condition, and the changes which they may produce in their reaction may be injurious or not in variable degree. In many cases the growth of the potato plant in treated soil returned to normal in the second year, although the reverse was sometimes observed, greater injury being evident the second season.

Tobacco disease investigations, W. B. Tisdale (*Florida Sta. Rpt. 1924, pp. 121–129, figs. 7*).—An account is given of investigations of black shank (*Phytophthora nicotianae*), root rot (*Thielavia basicola*), and wildfire (*Bacterium tabacum*), with notes on other tobacco diseases observed during the year.

In the black shank studies the author found that the fungus invaded all parts of the host plant, and in cultures it grew best in neutral or slightly acid media. The temperature range of the fungus was found to be from 10 to 35° C. (50 to 95° F). Tests of 54 selections for disease resistance showed only 4 to possess any improvement over previous tests. All varieties of Bright tobacco proved very susceptible.

Further trials showed that 2 selections of Big Cuba were highly resistant to root rot, but they had little resistance to the black shank disease.

Experiments for the control of wildfire proved successful. For seed-bed control, the author recommends making the seed beds on new land or thoroughly steaming the soil and materials used for cover, disinfecting the seed, and spraying the plants in the beds with Bordeaux mixture until ready to transplant. The spread of the disease in seed beds was prevented by heavy and frequent dusting with Bordeaux powder, although the disease developed on plants after they were set in the field. Cowpeas were found to be infected with the organism causing wildfire, and this disease was produced on tobacco seedlings sprayed with water suspensions from infected cowpeas.

A new disease, tobacco scab, was observed in several plant beds. This disease is characterized in its early stages by irregular, olivaceous blotches on the upper surface of the leaves and stems. In advanced stages infected leaves turn yellow, and during rainy periods the petioles and stems undergo a soft rot. A fungus with some of the characteristics of Cladosporium has been isolated from diseased seedlings.

[**Tobacco disease investigations**] (*Kentucky Sta. Rpt. 1924, pt. 1, pp. 28–31*).—Tobacco black root rot caused by *Thielavia basicola* is said to have been unusually severe during the season covered by the report. A considerable number of packages of seed of strains resistant to the black root rot were distributed for trial, and on the basis of comparative tests it is claimed that 65 per cent of the fields tested were damaged by black root rot. Back crossing the F_1 generation with susceptible parents was found valuable in the quick isolation of resistant strains of a desirable type of tobacco.

Brown root rot of tobacco is said to be a disease prevalent in both the Burley and Dark tobacco sections of Kentucky. It is characterized in some cases by completely stunting the plant, and in others by rotting a sufficient number of small rootlets to cause the plant to wilt in periods of drought. The cause of this disease has been studied, and from the rotting edge of small rootlets species of Fusarium have been isolated. Inoculation tests with all species of Fusarium isolated from the roots of tobacco and several other crop plants caused the infection of young seedlings of tobacco, red clover, alfalfa, alsike clover, radish, cabbage, and onions when grown in test tubes. Greenhouse experiments with tobacco plants showed that the majority of the species of Fusarium had no apparent effect on the growth of tobacco plants. In some cases a careful examination showed that the infection of small rootlets and reisolations from the roots of two such plants gave an organism which has been tentatively identified as *F. bulbigenum*.

Additional studies of bacterial leaf spot of tobacco have been said to indicate that the organisms are dead in tobacco one year or more old. Canvas thoroughly infected either with the angular leaf spot or with wildfire organisms and put on the seed bed at seeding time did not result in infection. The redrying process, which exposed tobacco to temperatures of from 155 to 170° for 40 minutes did not destroy the organisms, neither was seed treatment with corrosive sublimate effective in ridding the seed of organisms in experimental beds. In experimental beds the diseases were completely controlled by using seed raised in the greenhouse or seed from a single disease-free pod.

[**Blister canker control**] (*Illinois Sta. Rpt. 1924, pp. 126–128, figs. 2*).—The results are given of experiments by H. W. Anderson on the control of blister canker caused by *Nummularia discreta* on a Ben Davis apple orchard of 1,600 trees. The experiments were begun in 1919, employing a method of cutting out the cankers that has been previously described (E. S. R., 47, p. 449). A gradual reduction of newly infected trees has been noted in the orchard, and it is estimated that by 1930 the treated orchard may be expected to show only 25 per cent infection, which is considered remarkably low for a 30-year-old Ben Davis orchard.

Perennial canker of apple trees, S. M. Zeller and L. Childs (*Oregon Sta. Bul. 217 (1925), pp. 17, figs. 23*).—A preliminary account is given of a perennial canker of apple trees, a disease in the northwestern part of the United States, which in some of its stages is said to be difficult to distinguish from the apple tree anthracnose caused by *Neofabraea malicorticis.* The known distribution of this disease is said to be from the Okanogan Valley, British

Columbia, to the Willamette Valley, Oreg., and it is also reported from other stations in Washington and Oregon.

The disease is said to differ from apple tree anthracnose in its perennial character, its more distinct occurrence as a wound parasite, the shape of the conidia, and its reactions on culture media. The organism is described technically as *Gloesporium perennans* n. sp.

No control measures are positively known for this disease, but the authors believe that the liberal use of Bordeaux mixture and eradication by cutting out diseased tissues would aid in holding the disease in check.

Apple scald prevented by oiled paper wrapper (*Illinois Sta. Rpt. 1924, pp. 135, 136*).—W. A. Ruth is said to have confirmed experiments of the United States Department of Agriculture (E. S. R., 50, p. 552) relative to the efficiency of oiled paper preventing scald of apples in storage. Oiling the apples themselves prevented scald, but it is said that the fruit acquired an unpleasant flavor late in storage.

Spray did not interfere with set of fruit (*Illinois Sta. Rpt. 1924, pp. 128, 129*).—Experiments by W. A. Ruth and F. W. Newton are said to show that applications of lime sulfur and Bordeaux mixture made when apple trees were in bloom did not cause any consistent decrease in the number of fruit set.

The control of core break-down in pears, H. Hartman (*Oregon Sta. Bul. 216 (1925), pp. 4–16, figs. 2*).—A description is given of the core breakdown of pears, which is generally a storage trouble, making its appearance as the fruit approaches prime eating condition. The author claims that the development of core breakdown is undoubtedly closely related to the time of picking, and it is considered fairly certain that the trouble can be controlled by picking at the proper time. Storage in itself seems to have but little effect on the development of core breakdown, the amount of disease not seeming to be influenced by either the kind of storage or the length of the storage period. The pressure tester, previously described (E. S. R., 46, p. 641), proved a reliable indicator of maturity in pears, and maturity is considered the most effective weapon in the control of this disease.

[**Investigations on resistance of pear trees to fire blight**] (*Illinois Sta. Rpt. 1924, pp. 134, 135, fig. 1*).—A preliminary account is given of attempts made by H. W. Anderson to secure a variety of pear of good quality that is also resistant to blight. Seedlings of several species of Chinese pears have been grown, and experiments are in progress to determine whether the standard varieties grafted on resistant Oriental pears will survive better than those grafted on ordinary French seedlings. It is stated that the Pineapple pear, which is reported to be resistant to blight, is severely winterkilled in Illinois.

[**Lime sulfur for the control of gooseberry leaf spot and anthracnose**] (*Illinois Sta. Rpt. 1924, pp. 139, 140*).—Spraying tests made by A. S. Colby, in which several applications of lime sulfur were applied to gooseberry plants, showed that a delayed dormant lime-sulfur spray, followed by a summer strength lime-sulfur spray two weeks later, gave increased yields on both mulched and unmulched plats. Additional sprays were not found to be necessary.

[**Lime sulfur for the control of raspberry anthracnose**] (*Illinois Sta. Rpt. 1924, pp. 138, 139*).—An experiment conducted by A. S. Colby is said to have shown that anthracnose was controlled through two applications of lime sulfur, one of which was a delayed dormant spray made just as the leaflets were opening and the other a prebloom spray applied a week before the opening of the flowers. The addition of a casein-lime spreader is said to have

improved the value of the lime-sulfur treatment. Careful pruning and good cultivation were also found helpful in controlling anthracnose. The variety Quillan is said to be fairly resistant to the disease.

Bark diseases of citrus trees in California, H. S. FAWCETT (*California Sta. Bul. 395 (1925), pp. 3–61, figs. 19*).—This is a revision and abridgment of a previous bulletin of the station (E. S. R., 49, p. 649), with data on several diseases not noted in the earlier publication.

Dry root rot, with which species of Fusarium are constantly associated; Armillaria root rot, caused by *A. mellea;* decorticosis, or shellbark, of lemon trees of unknown causation; and Dothiorella gummosis, due to a fungus similar to *D. ribes*, are described.

Suggestions are given for the control of all the diseases described in the bulletin.

Dieback of citrus, R. W. RUPRECHT (*Florida Sta. Rpt. 1924, pp. 47, 48, 49*).—In continuation of investigations on the cause of die-back of citrus (E. S. R., 52, p. 248), the author reports ammoniation quite general throughout the grove, regardless of fertilizer treatment, and that die-back was not produced where the quantity of ammonia was doubled over the amount used in previous trials. Drainage waters were again collected from the experimental tanks and subjected to analysis, with results comparable with those of the previous year. The smallest loss of plant food was from the manure plats, while the sulfate of ammonia plats lost the greatest amount of calcium and sulfates. The large losses of ammonia as nitrates from the ammonium sulfate plats are said to indicate a rather rapid nitrification under the conditions of the experiments.

[**Control of wilt of China asters**] (*Illinois Sta. Rpt. 1924, p. 162*).—On account of the widespread loss of China asters due to wilt and yellows, F. F. Weinard has begun investigations on the cause and methods of control of these diseases. No varieties have been found to show marked resistance to either disease. In the greenhouse soaking the soil with a solution of 1 part of formaldehyde to 50 parts of water about a week before planting proved fairly effective in preventing wilt, but was less effective when applied to outdoor soils. Little progress is said to have been made on the cause or control of yellows. This disease is said to occur independently of wilt, and control measures which were partially effective for wilt did not seem to apply for the control of yellows.

Brown patch of lawns and golf greens, P. E. TILFORD (*Ohio Sta. Bimo. Bul., 10 (1925), No. 9, pp. 185–187, fig. 1*).—Brown patch, a fungus disease affecting grass, is said to occur in two types, large brown patch and small brown patch. The name is said to be descriptive of the disease, as brown areas or spots are produced in the turf. The large brown patch of grass is said to be caused by *Rhizoctonia solani*. Different varieties of grass vary in their susceptibility to attack, Kentucky blue grass being practically immune. Crab grass is entirely so, while red fescue and the bent grasses are very susceptible. For the control of brown patch on lawns the author recommends the application of Bordeaux mixture either in liquid form or as a dust. Chlorophenol mercury is also said to have given very satisfactory control. When a fungicide has been used on a lawn the treatment should be followed by top-dressing with fertilizers.

ECONOMIC ZOOLOGY—ENTOMOLOGY

Report of the entomologist [of the Florida Station], J. R. WATSON (*Florida Sta. Rpt. 1924, pp. 76–83, fig. 1*).—Studies of the Florida flower thrips (*Frankliniella bispinosa* Morg.) on citrus were continued during the year

(E. S. R., 52, p. 250). Trees sprayed once while in full bloom, on March 16, 1923, with a solution of lime sulfur 3 gal. and nicotine sulfate 0.75 pint to water 150 gal. bore less than one-third as many oranges sufficiently scarred to lower their grades from "brights" to "goldens" as the unsprayed trees. It was found that dusting with a mixture of finely ground tobacco was quite effective, though less so than the nicotine sulfate-lime dusts. Control work with root knot was continued (see p. 345).

In an investigation of the use of Crotalaria as a cover crop in citrus groves, it was found that the immature pods are more attractive than even tangerines to the larger plant bugs, particularly *Nezara viridula*, and serve to keep them off the fruit. A heavy infestation of mealybugs during the early part of the summer of 1923 was finally brought under control, largely by the carnivorous caterpillar *Laetilia coccidivora*. The most satisfactory spray solution tested was nicotine sulfate 1–800 in lime sulfur solution at rust-mite strength. Lime sulfur alone when used with good pressure was efficient, as was also a good grade of carbolic acid in 1 per cent solution. The mealybug parasite *Paraleptomastix abnormis* Gir., introduced from California, was recovered. Experiments showed the application of 25 per cent calcium cyanide dust at the rate of 150 lbs. to the acre to be the most effective means of controlling the chinch bug on St. Augustine grass. In control work with pecan insects, a spray consisting of 4 lbs. of lead arsenate, 12 lbs. of lime, 2 lbs. of calcium caseinate, and 200 gal. of water, applied on March 29, just as the foliage was beginning to appear, and again on April 27, resulted in practically complete control of leaf or cigar case bearer and little scab. This formula was used in Bordeaux mixture instead of water on varieties known to be susceptible to scab. In combating the bean jassid, it was found that copper-lime dusts to which 3 per cent nicotine was added did not adhere as well as Bordeaux mixture, and the effects were not as lasting.

Reference is made to investigational work with the citrus aphid, an extended account of which has been noted (E. S. R., 52, p. 755).

[Report of the Montana Station] department of entomology, R. A. COOLEY (*Montana Sta. Rpt. 1924, pp. 31–34*).—The author reports briefly upon the occurrence of, and work of the year with, some of the more important insects, the climatic relationship of insects, attractive baits for insects, etc.

[Work with insect pests by the Pennsylvania Station], S. W. FROST and J. L. HORSFALL (*Pennsylvania Sta. Bul. 196 (1925), pp. 32, 33*).—The results of work with the red spider in 1924 were duplicated in 1925. Additional data were secured to show that both home-mixed oil emulsions, commercial emulsions, and miscible oils will kill a large percentage of the eggs of the red spider if applied to apple at the time of the delayed dormant spray. Cold mixed calcium caseinate emulsions have been used with success with various types of oils ranging from a viscosity of 12 to 250 Saybolt at 100° F. The oils of the higher viscosity were more satisfactory.

Life history studies are being conducted on the leaf roller *Amorbia humerosana* Clem., which differs remarkably from the habits of the red-banded leaf roller, *Eulia velutinana* Wlk. (E. S. R., 53, p. 558), and has at times caused serious injury to early varieties of apples.

Investigations of the life history and control of the oriental peach moth are under way. Thus far, cultivation of peach orchards previous to the middle of April has helped to cut down the infestation.

In a search made for a powdered material which can be used to replace soap as a spreader in a liquid nicotine spray for plant lice, a miscible oil, calcium caseinate (two standard brands), skim-milk powder, and powdered glue were

compared with fish-oil soap as a standard. When used without lime, none of the mixtures gave as high a kill as fish-oil soap and nicotine. With the addition of hydrated lime, the efficiency of each mixture was increased to a point where it equaled or exceeded that of the soap standard. Foliage spotting was obtained on rutabagas with all combinations in which lime was incorporated, although no check was administered to growth. Further trials on the foliage of a variety of vegetable crops are considered desirable before definite recommendations can be made.

Treatment of the cabbage maggot on early cabbages with corrosive sublimate dissolved in water, 1 oz. to 8 gal., gave excellent results, consistent with those of the three previous seasons.

Various soil fumigants were used on an experimental scale in lettuce cold frames for control of millipedes. Nicotine sulfate in water, 1–500, used at the rate of 1 gal. to 2.5 sq. ft., resulted in an increased stand. A 2 per cent home-mixed nicotine dust worked into the soil one week before the boxes were seeded gave good results. The pests were controlled with calcium cyanide, broadcasted and worked into the soil at the rate of 600 lbs. to the acre two weeks before seeding, and also by a soot-naphthalene compound mixed with equal parts of sand by volume, applied at the rate of 150 lbs. to the acre, two weeks before seeding.

Studies on Nicotiana rustica as a source of nicotine for insect control, D. E. Haley (*Pennsylvania Sta. Bul. 196 (1925), p. 11*).—A brief reference is made to insecticide studies of *N. rustica*, an account of which has been previously noted (E. S. R., 52, p. 535). It has been found that, when this high nicotine tobacco is well pulverized and mixed with calcium oxide or hydroxide and water, a satisfactory dust is obtained for the control of aphids. The percentage of nicotine in the dust was controlled by varying the quantity of tobacco or lime, holding the percentage of water constant. Thirty per cent of the entire weight of the tobacco and lime was found to be the optimum amount of water to add to this mixture. Notwithstanding this high water content, the dust was found to adhere quite well to foliage.

Lead arsenate best check for eggplant pests (*Illinois Sta. Rpt. 1924, pp. 155–158*).—A brief account is given of an experiment conducted by C. B. Sayre, in which the efficiency of the various dusts and sprays used in controlling insect enemies on eggplants is reported. Work was begun in 1923 with nine different treatments, and continued in 1924 with some changes in the dusts and sprays used. The effectiveness of the various dusts and sprays, the comparative costs of the different treatments and the net returns, the effect on the yield and growth of the plant, and the relative convenience in application were determined.

The results indicate that a dilute reduced lime-Bordeaux-arsenate of lead spray is the best for controlling the insects, particularly flea-beetles. Bordeaux of standard strength stunted the plants somewhat. Reducing the lime used in making Bordeaux mixture reduced the stunting effect and increased the yields, while diluting the reduced lime-Bordeaux mixture gave the best results. It is pointed out that, while Bordeaux mixture is probably of some value as a repellant of flea-beetles, the arsenate of lead mixed with the Bordeaux is the most important ingredient of the spray for controlling them, i. e., the insects are actually killed by the arsenate of lead when they eat the foliage rather than repelled by the other ingredients of the spray. The results indicate that the best spray for controlling flea-beetles on eggplants, considering costs and net returns, is an arsenate of lead spray used at the rate of 2 lbs. of powdered arsenate of lead, 1 lb. of hydrated lime, and 50 gal. of water.

Dusts did not prove quite so effective as the two sprays used. The plat dusted with copper stearate ranked third in the whole series and first in the dusted plats in yield per plant. The plat dusted with calcium arsenate and gypsum produced practically the same yield as the copper stearate plat, but the copper stearate is by far the lightest and fluffiest of any of the dusts used. It is, therefore, very easy to apply and covers a larger area than other dusts of equal weight. Gypsum proved to be more satisfactory than finely ground rock phosphate as a carrier for calcium arsenate dust. Arsenite of zinc caused a slight burning and stunting of the plants, while calcium arsenate was much superior to either arsenite of zinc or arsenate of lead as the poisonous ingredient of the dusts used. From the home garden standpoint, a dust composed of 1 lb. of calcium arsenate and 4 lbs. of gypsum is probably the most satisfactory treatment when effectiveness, cost, and convenience of application are considered. From the standpoint of large scale production, the greater effectiveness of the arsenate of lead spray would make it the most economical treatment, considering net results.

Some important grape insects, L. G. Gentner (*Michigan Sta. Spec. Bul. 148 (1925), pp. 19, figs. 13*).—This is an account of the more important insect enemies of the grape in Michigan, based largely upon observations in the vicinity of Lawton.

Particular attention was given to the grape berry moth, which for several years had badly infested vineyards in the vicinity of Paw Paw and Lawton. Observations have shown that its seasonal history in Michigan is quite similar to that of northern Ohio and New York, accounts of which have been noted (E. S. R., 35, p. 358; 37, p. 852; 44, p. 457). Five species of hymenopterous parasites were reared, including *Dioctes obliteratus* (Cress.) and *Habrobracon gelechiae* Ashm. from the first-brood larvae and *Spilocryptus polychrosidis* Cush., *Glyptia mutica* Cush., and *Microbracon variabilis* (Prov.) from first-brood cocoons. *Elachertus coxalis* How. was taken while trying to oviposit in a second-brood larva. In some vineyards these parasites were responsible for considerable reduction in the number of grape berry moths. In one neglected vineyard 28 per cent of the first-brood cocoons gathered from the four outer rows showed emergence holes of parasites. Tests have shown that the pest can be satisfactorily controlled by the use of sprays such as have been recommended by the station for several years. The insecticide recommended consists of 3 lbs. of powdered lead arsenate or 2 lbs. of powdered calcium arsenate to 100 gal. of Bordeaux mixture, to which 2 lbs. of resin fish-oil soap has been added as a sticker.

A brief account is given of the grape mealybug (*Pseudococcus maritimus* Ehrh.), which is quite generally distributed throughout the grape-growing district of southwestern Michigan. A hymenopteran, *Pseudaphycus angelicus websteri* Timb., parasitizes the mealybug, as many as five larvae having been found in an individual. A small ladybird beetle, *Hyperaspis undulata* Say, was also quite abundant and actively fed upon the eggs and newly emerged young, greatly reducing their numbers.

The grape leafhopper and the three-banded leafhopper (var. *cymbium*) are next considered. Their enemies include the red mite *Anystis agilis* Banks, an active feeder on the nymphs; the hymenopteran *Aphelopus comesi* Fen., which oviposits in young leafhoppers; and *Hyaliodes vitripennis* Say, a hemipteran which fed on the leafhoppers.

The lepidopteran *Antispila isabella* Clem. was found mining between the two surfaces of grape leaves, both cultivated and wild. It occurred in sparing numbers in most vineyards, but in one neglected vineyard was present in

considerable numbers. Brief reference is made to *Reticulitermes flavipes* Kol., frequently found in the vineyards working in dead stubs, and also to a true thrips, *Leptothrips mali* Fitch, a predacious species feeding on other thrips, mites, and aphids.

Grape leaf-hoppers (*Kentucky Sta. Rpt. 1924, pt. 1, p. 28*).—This is a brief account of control measures for the grape leafhopper, the variety *Erythroneura comes octonotata*, and of *E. vulnerata*, studies of which have been previously noted (E. S. R., 52, p. 753).

The effect of low temperatures on Bruchus obtectus Say, an insect affecting seed, W. CARTER (*Jour. Agr. Research* [*U. S.*], *31* (*1925*), *No. 2, pp. 165–182, figs. 6*).—Following a review of the literature, the author reports upon experimental work at the University of Minnesota on supercooling and freezing and on the upper limits of low temperatures fatal to the bean weevil, the details of which are presented in tabular and chart form.

Active adults were found to withstand a temperature of −10° C. (+14° F.) for a period of three hours, while pupae and advanced larvae withstood the same temperature for seven hours. It was found impossible to obtain the exact freezing point of the bean weevil with present-day electrothermal methods. It is pointed out that investigations have shown that an insect is killed if a rebound occurs after the supercooling, even if the supercooling temperature is not again reached, the rebound being evidence that heat of crystallization is given off. Crystallization of the lymph is believed to be responsible for the death of the insect.

"There is a distinct correlation between the supercooling point and the rebound point, but this is believed to be due to radiation from the insect to the air of the cooling chamber. The exact freezing point is actually much higher, then, than the rebound points recorded. The temperature-time experiments show that time is a factor in the resistance of *B. obtectus* to low temperature. It is apparent, with freezing points as high as those of this insect must be, that supercooling takes place at temperatures of −10° or below. That being the case, the data imply that supercooling is possible for limited times only at certain temperatures. The relationship between supercooling and the rate at which the insect has cooled has been studied. There seems to be no correlation between these two factors.

"A condition of post-freezing development with ultimate death has been observed at temperatures just below the limits of resistance. This has been referred to in this paper as 'arrested development.' It manifests itself in the adults as failure to emerge, due to the loss of the insect's capacity to cut its way out of the bean; pupae can metamorphose only to adult form in the head and thoracic regions, the abdomen remaining undeveloped; larvae are unable to emerge from the egg, or, if they do emerge, it is often through the side of the egg, not through the operculum. Many that emerge from the egg are unable to enter the bean.

"The limits of the fatal temperature-time zones have been determined for four stages of *B. obtectus*. This insect apparently has no capacity for hardening. The thermal constant, as described by Sanderson and Peairs [E. S. R., 31, p. 847] has not been worked out for this insect. A difference of less than 10° F.—the difference obtaining between the temperature of the laboratory and a cool, dry basement at about 64°—almost doubles the length of time required for a complete life cycle. This means that even in the South development of the insect could be retarded considerably until fatal outdoor temperatures prevailed."

Control of the cabbage maggot in the seedbed, H. GLASGOW (*New York State Sta. Bul. 512* (*1924*), *pp. 5–112, pls. 13, figs. 3*).—The author first discusses

the importance of the pest, describes its several stages and seasonal history, describes its injury, and discusses the activities of flies in relation to blooming period of fruit trees, the seasonal distribution of maggot injury, and its host relations. Control experiments from 1920 to 1923, inclusive, are then reported upon year by year, much of the data being presented in tabular form. Cultural methods of control (pp. 49–68) and control by insecticides (pp. 68–91) are then considered at length. Discussions of the relation of seed-bed diseases to maggot control, the elimination of maggots at transplanting, and the cost of various treatments follow.

It is pointed out that there are three thoroughly dependable methods from which the grower may choose, namely, (1) the cheesecloth screen, (2) treatment with corrosive sublimate (mercuric chloride) solution, and (3) applications of tobacco dust. Other methods for protecting the seed bed have been tested and some have distinct merit, but none of these has been found wholly dependable. The author found the protection of the seedlings through the use of a cheesecloth screen to be by far the most generally accepted method of avoiding maggot injury in western New York. The use of solutions of corrosive sublimate, while also effective for maggot control, is of more recent origin and has not as yet come into such general use in seed-bed work. Tobacco dust, when properly applied, is effective in controlling the maggot, and also through its action as a fertilizer and mulch produces exceptionally fine, sturdy plants.

At prevailing prices the use of tobacco dust is much more expensive than either of the other two methods, and, under some conditions, appears to favor the development of certain seed-bed diseases. Solutions of mercuric chloride, on the other hand, in addition to giving protection from the maggot, have the added advantage of checking various seed-bed diseases, such as Rhizoctonia and club root. Mercuric chloride is dissolved in water at the rate of 1 oz. to 10 gal., and applied in a solid stream along the row at the rate of 1 gal. of the solution to from 20 to 40 ft. of row, so as to thoroughly moisten the soil immediately about the plants.

The Mexican bean beetle in Indiana, J. J. Davis (*Indiana Sta. Circ. 126 (1925), pp. 11, figs. 7*).—This is a brief summary of information on the Mexican bean beetle, which made its first appearance in the State in 1924 in five counties along the Ohio River in southeastern Indiana. By August 1, 1925, it had spread to Crawford County on the west and Monroe and Fayette Counties on the north.

The effect of weather upon the change in weight of a colony of bees during the honey flow, J. I. Hambleton (*U. S. Dept. Agr. Bul. 1339 (1925), pp. 52, figs. 12*).—This bulletin presents information on the relationship existing between changes in the weight of a colony of bees during a honey flow and the prevailing weather conditions, based upon data obtained at the U. S. D. A. Bee Culture Laboratory, at Somerset, Md., from February to November, 1922, and during May, 1923. The author discusses the method of obtaining and of presenting data, comparison of changes in weight of two colonies of bees, the spring and the fall periods, correlations between external factors and the changes in colony weight, the effect of unknown factors on changes in colony weight, and theoretically changing weather factors and predicting resulting gains, much of the data being presented in tabular form. He has made correlations between the changes in the weight of two colonies of bees during the various periods of the day and several weather factors.

"From the standpoint of the results of these comparisons, the most important weather factors of those included in this investigation affecting net gain

during the spring period, and, in order, the values of their coefficients of correlation, are average temperature 0.7529, hours of sunshine 0.6124, temperature variation 0.5967, solar radiation 0.5525, variation of relative humidity 0.4229, and average relative humidity —0.3806. Weather factors have but little influence upon nocturnal loss during the spring period, the coefficients of correlation being temperature variation —0.3439, average temperature 0.1754, average relative humidity —0.1264, and variation of relative humidity —0.0654. During the fall period diurnal changes in colony weight were differently influenced by weather factors, the coefficients of correlation between these changes and the several weather factors being for temperature variation 0.5570, variation of relative hnmidity 0.3800, average temperature —0.2310, average relative humidity —0.0960, hours of sunshine 0.0595, and solar radiation —0.0341. During the fall period the influence of the weather factors upon nocturnal loss was greater than in the spring, the coefficients of correlation being for variation of relative humidity 0.5391, variation of temperature 0.5136, average relative humidity —0.4821, and average temperature —0.3391. The importance of the unknown factors influencing net gain during the spring period was less than that of the unknown factors influencing diurnal changes in the colony weight during the fall, the value of the former being 0.3470, while that of the latter was 0.5360. For the spring period the value of the unknown factors upon nocturnal loss was 0.7026, while that for the fall period was 0.5614. Factors influencing the secretion of nectar probably do not similarly influence changes in colony weight. The changes in the weight of two colonies of bees placed side by side continuously resembled each other."

ANIMAL PRODUCTION

Roughage digestibility unchanged in silo (*Illinois Sta. Rpt. 1924, p. 95*).—The digestibility of corn stover silage when fed with soy bean oil meal has been determined by T. S. Hamilton and H. P. Rusk as follows: Dry substance 54 per cent, crude protein 38, ether extract 59, nitrogen-free extract 56, crude fiber 67, and energy 55 per cent. The metabolizable energy of corn stover silage was found to be 1.57 therms per pound of digestible organic matter. These coefficients indicate that the digestibility of corn stover silage is practically the same as that of corn stover.

The nutritive value of wheat.—I, Effect of variation of sodium in a wheat ration, G. A. Olson and J. L. St. John (*Jour. Agr. Research* [U. S.], *31 (1925), No. 4, pp. 365–375, figs. 6*).—A more complete account of the results of experiments previously noted (E. S. R., 52, p. 866.)

Commercial feeding stuffs, O. S. Roberts et al. (*Indiana Sta. Bul. 294 (1925), pp. 28, fig. 1*).—This is a summary for the calendar year 1924 of the commercial feeds sold in Indiana, the number of samples of feed of each manufacturer inspected and passed, and a brief discussion of mineral and condimental feeds. The previous report has been noted (E. S. R., 51, p. 571).

Selection, care, and management of breeding stock, C. S. Platt (*New Jersey Stas. Hints to Poultrymen, 14 (1925), No. 2, pp. 4, fig. 1*).—Popular directions for the selection, feeding, management, and care of breeding stock.

Fowler's solution is harmful to show males (*Illinois Sta. Rpt. 1924, pp. 95, 96*).—Preliminary results obtained by E. Roberts with rabbits indicate that the reproductive cells of males may be so injured by the use of Fowler's solution, as is often given to livestock for exhibition, that the fertility is lessened. One

group of males which received Fowler's solution produced only 23 young, while males which had not been fed the solution produced 121 young.

Cattle feeding in Arizona, E. B. STANLEY and E. L. SCOTT (*Arizona Sta. Bul. 108 (1925), pp. 41, figs. 14*).—The results of three cattle feeding experiments are given in the three parts of this bulletin. The first part gives a complete report of the experiment previously noted (E. S. R., 53, p. 769), in which comparisons were made of the rate and economy of gains of calves, yearlings, and 2-year-old steers and old cows.

The second part of the bulletin gives the results of an experiment in which the relative feeding values of hegari and corn silage for 2- and 3-year old steers were compared. The feeding period was 120 days. The rations of all lots included alfalfa hay and silage ad libitum, while cottonseed meal was fed in limited amounts. Hegari silage was given to lot 1, which consisted of short 2-year-olds averaging 590 lbs. in live weight, and to lot 4, which consisted of 2-year-olds averaging 693 lbs. in live weight. Lot 3, which was also composed of 2-year-olds averaging 656 lbs. in live weight, received corn silage, as did lot 2, which was composed of 3-year-olds averaging 1,165 lbs. in live weight. The supply of corn silage was exhausted at the end of 79 days, and these two lots were continued on hegari silage. The amounts of cottonseed meal fed were variable, beginning with small quantities about three weeks after the experiment began and increasing to a maximum of 3 lbs. per head for the short 2-year-olds, 3.5 lbs. for the other 2-year-olds, and 4 lbs. for the 3-year-olds. At the end of the first 79 days the 2-year-olds receiving hegari silage had made an average daily gain of 2.47 lbs. per head as compared with 2.23 lbs. by lot 3, which received corn silage. It is, however, pointed out that the corn silage was of inferior quality. The 3-year-old steers were finished after 105 days' feeding and were marketed, at which time they had made an average daily gain of 2.28 lbs. per head, having consumed 1,090 lbs. of dry matter per 100 lbs. of gain. The average daily gains for the 2-year-olds during the 120-day feeding period were 2.16 lbs. each for lots 1 and 3 and 2.32 lbs. for lot 4. The respective lots consumed 937, 936, and 959 lbs. of dry matter per 100 lbs. of gain.

The third part of the bulletin reports a further comparison of corn and hegari silages and a study of the effect of age and sex on the fattening qualities of cattle. There were selected for this experiment lots of 10 Hereford steers of each age, yearling, 2-year-old, and mature, and 3 lots of 10 Shorthorns each, 2 lots of which were yearling steers and 1 yearling heifers. All lots received alfalfa hay and hegari silage, except that the yearling Shorthorn heifers, lot 4, and 1 lot of yearling Shorthorn steers, lot 5, received corn silage in place of hegari silage. Due to the large amounts of silage consumed, it became necessary to limit the amounts fed per head daily as follows: 25, 30, 37, and 34 lbs., respectively, for the yearling, 2-year-old, and mature steers and the yearling heifers. Cottonseed meal was given at the rate of 2.5, 3, and 4 lbs. per head daily to the yearling, 2-year-old, and mature cattle. Cracked hegari was given during the last 30 days of the feeding period at the following rates for the respective ages: 5, 6.5, and 8 lbs. As in the earlier studies of the effect of age, the yearling steers were found to utilize the feed most efficiently, but the calculated profits were in favor of the older cattle, due to the greater margin in the prices received. In the comparison of heifers and steers, the heifers which averaged 595 lbs. in live weight at the start made average daily gains of 2.35 lbs. in the 120 days, while the yearling steers averaging 617 lbs.

at the beginning made an average daily gain of 2.51 lbs. The steers also utilized their feed more efficiently and brought higher prices at market. The gains made by the lots of Shorthorn yearlings on the corn and hegari silages were practically identical, being 2.51 and 2.50 lbs. per head daily, but the hegari lot brought a little better price at market though there was no apparent difference in the carcasses. A study of the effect of limiting the amount of silage fed indicated that as soon as this method was put into practice there was an increased consumption of alfalfa hay, which resulted in the feeding of a narrow ration. It was during this period that a marked decrease in the rate of gains made by all lots was apparent. The addition of cracked hegari to the ration during the last 30 days materially stimulated the rates of gain, thus indicating the advisability of adding grain to rations high in roughage and crude protein during the later stages of the fattening period. Data were obtained on the shrinkage of the cattle during shipment to the feed lot at the beginning of the experiment and during shipment to the market at the end of the test. Dressing percentages are also given.

[**Feeding experiments with beef cattle at the Illinois Station**] (*Illinois Sta. Rpt. 1924, pp. 73–76, fig. 1*).—The results of three experiments with beef cattle are briefly noted.

Farm production of feeder cattle studied (pp. 73, 74).—In a study by H. P. Rusk of the possibility of raising feeder cattle in the Corn Belt, cows have been successfully reared on feed that would not ordinarily be sold from the grain farm. The cows were wintered on corn stover silage and pastured in the summer on sweet clover and in the fall on oat stubble seeded to sweet clover and cornstalks after husking. Unseasonable weather made it necessary to utilize some emergency pasture and other feed during the past year.

Pasture and dry lot compared for beeves (pp. 74–76).—In a study by R. R. Snapp 4 lots of 10 3-year-old steers averaging approximately 1,000 lbs. in live weight were full-fed on corn during the 140-day period from May 12 to September 29. Two of the lots were on pasture, the one being on sweet clover and the other on blue grass. The other 2 lots were finished in dry lot with corn silage and alfalfa hay, respectively. The results of the experiment showed that larger gains were secured in dry lot than on pasture, especially with the silage fed cattle, and less corn was required per unit of gain in dry lot, but the calculated costs were slightly greater than for the pastured animals. The dressing percentages were approximately 1 per cent more for the dry lot fed steers than for those fed on pasture. The finish and dressing percentages of the steers receiving corn silage were especially good. Of the 2 pasture crops, blue grass proved superior to sweet clover, especially during May and early June and after the middle of August. The cattle on blue grass showed more finish and sold for 25 per cent more per 100 lbs. than the cattle on sweet clover.

Soy bean meal equal to cottonseed meal (p. 76).—In a comparison by H. P. Rusk and R. R. Snapp with soy bean meal and cottonseed meal for fattening beef cattle, 2 lots of 18 2-year-old Hereford steers were used. The ration consisted of ground corn, corn silage, and alfalfa hay, with cottonseed meal or soy bean meal. Both feeds proved highly satisfactory, and the results indicated that both were of practically the same feeding value.

Steer feeding [at the Kentucky Station] (*Kentucky Sta. Rpt. 1924, pt. 1, pp. 23, 24*).—In continuing studies of the rapidity and economy of gains made by steers receiving silage through the entire feeding period as compared with

the substitution of a legume hay for the silage near the end of the feeding period (E. S. R., 52, p. 466), the third year's results have been completed.

The steers fed silage throughout made an average gain of 1.77 lbs. daily, consuming an average ration of 15.5 lbs. of broken ear corn (127 days), 3.1 lbs. of cottonseed meal, 34.18 lbs. of corn silage, and 1.71 lbs. of wheat straw. The other lot made an average daily gain of 1.88 lbs. and consumed an average daily ration of 15.9 lbs. of broken ear corn (127 days), 2.62 lbs. of cottonseed meal, 39.12 lbs. of silage (110 days), 9.18 lbs. of alfalfa hay (51 days), and 1.78 lbs. of wheat straw. The lot receiving silage throughout was valued at 20 cts. more per 100 lbs., due to a better appearance at the conclusion of the test. Estimated returns each year have been in favor of the lot receiving silage throughout the entire feeding period.

[Feeding experiments with beef cattle at the Nebraska Station] (*Nebraska Sta. Rpt. [1924], pp. 19, 20, 21*).—The results of feeding experiments are briefly reported, the first of which is continued from the previous year (E. S. R., 52, p. 268).

Effect of age upon rate and economy of gain.—The fourth year's trial in comparing calves, yearlings, and 2- and 3-year-old steers for fattening is reported. The 4 lots consisting of 10 steers each were fed on shelled corn and alfalfa hay during a 200-day period. The results showed that the greatest gains were made by the oldest steers, while the calves made the lowest gains. On the basis of the gains made per bushel of corn consumed, the 3-year-olds gained 6.2 lbs., the 2-year-olds 6.7, the yearlings 7.5, and the calves 9.6 lbs. In the 4 experiments so far completed, the older cattle have made rapid gains during the first 100 days, followed by a sharp reduction in gains during the second 100 days. The calves have made consistent gains throughout the feeding period. The combined results point toward the desirability of utilizing younger cattle in the feed lots of the State.

Summer cattle feeding.—The results from feeding 3 lots of 10 steers each during the summers of 1923 and 1924 are reported. In each experiment the rations consisted of shelled corn and alfalfa hay fed in dry lot, shelled corn with Sudan grass pasture, and shelled corn with sweet clover pasture. The cattle fed in dry lot made the most rapid gains and were better finished but consumed more grain than those fed on pasture. More efficient gains were made in dry lot than by cattle similarly fed during the winter months.

Preparations of hegari for finishing yearling steers, R. H. Williams and C. A. Smith (*Arizona Sta. Bul. 107 (1925), pp. 411–436, figs. 10*).—Various methods of preparing hegari for feeding yearling steers have been compared.

Eight lots of 10 yearlings each averaging 487 lbs. in live weight were fed for 112 days as follows: Lot 1 received hegari silage and alfalfa hay ad libitum plus 3 lbs. of cottonseed meal per head daily. Lots 2, 3, 4, 5, and 6 received the same amount of alfalfa hay as was consumed by lot 1 and also 3 lbs. of cottonseed meal per head daily, with the addition of hegari fodder ad libitum in lot 2, hegari stover silage ad libitum in lot 3, hegari stover ad libitum in lot 4, hegari stover silage ad libitum plus an amount of ground hegari grain equal to that removed from the stover in lot 5, and hegari stover ad libitum with ground hegari grain returned in proportion to the amount removed in making the stover in lot 6. Lots 7 and 8 were fed hegari silage and alfalfa hay ad libitum plus 3 lbs. of cottonseed meal with the addition in lot 7 of 4 lbs. of ground hegari grain and in lot 8 of 8 lbs. of ground hegari grain per head daily.

The results of the different methods of feeding the hegari are summarized in the following table:

Results of various methods of feeding hegari to yearling steers

Lot	Average initial weight	Average daily gain	Feed required per 100 pounds gain							Dressing percentage
			Ground Hegari	Hegari silage	Hegari fodder	Hegari stover silage	Hegari stover	Alfalfa hay	Cottonseed meal	
	Pounds	*Pounds*	*Pounds*	*Pounds*	*Pounds*	*Pounds*	*Pounds*	*Pounds*	*Pounds*	*Per cent*
1	482	2.11		1,518				142	137	53.43
2	474	1.95			891			154	144	56.92
3	495	1.90				1,686		158	152	51.54
4	491	1.53		258			913	196	168	48.62
5	492	2.18	183			1,267		138	183	55.72
6	486	2.00	181	185			551	150	144	52.75
7	492	2.28	166	1,231				90	127	56.61
8	483	2.37	314	978				90	121	57.01

In discussing the results, it is pointed out that hegari silage produced larger and more economical gains and a better finish on the cattle than hegari stover. Stover silage was also superior to stover. The headed plant produced cheaper gains than the entire plant but not as rapid gains or as good a finish as the latter. When the threshed and ground grain was fed the gains were only 3 per cent greater than when the whole plant was used as silage. The extra cost does not appear to warrant the practice of heading, threshing, and grinding. The addition of grain to the basal ration, as shown by lots 7 and 8, increased the rate of gain in direct proportion to the amount added, but the superior finish was not valued sufficiently high to cover the extra expense.

Fattening heifer calves, G. Bohstedt (*Ohio Sta. Bimo. Bul., 10 (1925), No. 9, pp. 170–175, fig. 1*).—For determining the necessity of adding corn and oil meal to a ration of alfalfa hay and corn silage for fattening heifer calves, 5 lots of 10 Highland Hereford calves each were fed for 105 days in 1925. The rations were full-fed, except that the oil meal was limited to 2 lbs. daily.

The lot receiving alfalfa hay and corn silage only made an average daily gain of 1.45 lbs., but the gains increased with the addition of the different supplements, being with oil meal 1.98 lbs., with corn 2.27, with corn during the last 8 weeks only and oil meal throughout 2.40, and with corn and oil meal 2.77 lbs. The finish of the calves is indicated by the selling price per 100 lbs., which was $9.25 for those receiving the basal ration and $10, $10.75, $10.50, and $11, respectively, for the lots receiving the supplements in the order given above. The calculated profits were much greater with the supplemented rations.

[Nutrition studies with sheep at the Illinois Station] (*Illinois Sta. Rpt. 1924, pp. 80–83*).—In studies by H. H. Mitchell, T. S. Hamilton, and W. G. Kammlade the results of determinations of the energy value of alfalfa hay and the digestibility of soy bean products are briefly noted.

Determine energy value of alfalfa for sheep.—Twelve sheep weighing from 80 to 100 lbs. each were used for determining the amount of alfalfa hay required for maintenance. During the maintenance period metabolism experiments were run and determinations made of the amount of metabolizable energy required to maintain the individuals at constant weight. Six of the animals were killed at the end of the maintenance experiment and the carcasses

analyzed. The other six sheep were full-fed on alfalfa hay until maximum gains had been obtained, after which their carcasses were analyzed and the net energy value of the alfalfa hay fed above the maintenance requirements was calculated for each individual. The average net energy value was determined as 32.63 therms per 100 lbs. of hay, or 35.8 therms if the results with one animal were eliminated. In the maintenance trials, an average of 2.29 lbs. of alfalfa hay per day per 100 lbs. live weight was required to maintain a uniform weight.

Comparisons of the digestibility of the alfalfa hay on the maintenance and fattening rations indicated that the metabolizable energy of 1 lb. of digestible organic matter of the alfalfa hay was 1.69 therms in the maintenance trials and 1.74 therms for the fattening sheep. Thus the fattening sheep apparently made slightly better use of alfalfa hay.

An important finding in this work was the relation of fill to the body weight. In the 6 sheep killed on the maintenance ration the fill was equal to 17 per cent of the live weight and on the fattening ration it was equal to 16 per cent, but the actual weights of the contents of the stomach and intestinal tract of the sheep on the 2 rations were, respectively, 13 lbs. 4 oz. and 18 lbs. 12 oz. This increase in fill was equal to 15 per cent of the total live weight increase.

Soy bean digestibility for sheep studied.—The digestibility of soy bean hay, soy bean straw, and oat straw was determined with 12 sheep fed in amounts approximately equal to maintenance as follows:

Digestibility by sheep of soy bean products and oat straw

Kind of feed	Dry substance	Crude protein	Ether extract	Nitrogen-free extract	Crude fiber	Energy
	Per cent	*Per cent*	*Per cent*	*Per cent*	*Per cent*	*Per cent*
Soy bean hay	54	69	62	64	35	53
Soy bean straw	41	15	15	54	32	38
Oat straw	46	15	23	45	57	45

In further experiments to determine the digestibility of soy bean oil meal and whole soy beans fed, respectively, with soy bean straw and oat straw, impossible coefficients were obtained for the carbohydrates, indicating a marked effect of the roughage on the digestibility of the concentrates, or vice versa.

[Experiments with sheep at the Kentucky Station] (*Kentucky Sta. Rpt. 1924, pt. 1, p. 22*).—The results of the following experiments are briefly reported:

Feeding breeding ewes.—A study of six years' records kept on the feeding of 250 ewes during the period of pregnancy indicated in practically every case that the ewes have come through the winter in good condition and a large lamb crop has been produced when the ration has contained an ample amount of protein. Clover and alfalfa have proved to be the best sources of protein. Wheat straw and silage are unsatisfactory unless fed in conjunction with a protein feed.

Fattening spring lambs.—In comparing blue-grass pasture with a mixture of rape and oat pasture, one lot of 19 lambs was turned on each on June 2, 1924. These lambs were permitted to nurse their dams and were given a grain mixture consisting of rolled oats, bran, and pea-size linseed meal (10:2:1). The lambs on the blue-grass pasture, which was unlimited in amount, made an average gain of 11.8 lbs. in 28 days, while those on rape and oat pasture (limited to 1 acre) made an average gain of 12.5 lbs.

[Experiments with sheep at the Pennsylvania Station] (*Pennsylvania Sta. Bul. 196* (*1925*), *p. 12*).—Brief results of two experiments are given.

Crossbreeding Merino ewes and Dorset×Merino F_1 ewes with mutton rams, W. L. Henning.—In this experiment the crossbred ewes mated with the Dorset rams produced very desirable hothouse lambs, which fattened quickly and were of the desired quality.

Comparative method of docking and castrating lambs, J. F. Shigley.—The results of a comparison of docking lambs with hot docking pincers and with the emasculator were in favor of the use of the emasculator.

Sheep feeding.—XIII, Fattening western lambs, 1924–1925, J. H. Skinner and F. G. King (*Indiana Sta. Bul. 296* (*1925*), *pp. 11*).—This is a repetition of the experiment previously noted (E. S. R., 52, p. 170). The data are summarized in the following table:

Summary of 1924–25 lamb feeding trials at the Indiana Station

Lot	Average initial weight	Average daily gain	Feed consumed per pound of gain			Selling price per 100 pounds	Estimated profit per lamb
			Concentrates	Silage	Hay		
	Pounds	*Pounds*	*Pounds*	*Pounds*	*Pounds*		
1	58.3	0.431	3.10	5.55	2.51	$16.45	$2.63
2	58.2	.427	3.19	5.60	2.43	16.20	2.48
3	58.6	.428	3.21	5.73	2.59	16.30	2.34
4	58.3	.442	3.27	5.39	2.33	16.45	2.69
5	58.3	.441	3.35	5.40	2.31	16.35	2.54
6	58.4	.440	3.02	5.43	2.47	16.25	2.59
7	58.6	.404	3.30	5.91	2.62	16.40	2.31
8	58.5	.438	3.05	5.45	3.79	16.55	2.62

Fattening lambs for the late winter market, H. K. Dean and E. L. Potter (*Oregon Sta. Bul. 218* (*1925*), *pp. 11*, *figs. 4*).—In studies of different methods of fattening lambs at the Umatilla Substation during the winters 1923–24 and 1924–25, 4 lots of lambs averaging approximately 60 lbs. in weight were used for the tests each year. All lots were given alfalfa hay, and a total of 75 lbs. of grain per head was allowed. The grain was fed differently. In lot 1 it was given at the rate of 0.5 lb. daily through the entire experiment. In lots 2, 3, and 4 the entire amount of grain was equally divided over the last 100, 75, and 50 days, respectively, of the fattening period.

The results showed that the gains on hay alone were very small, averaging 0.06 lb. per head daily in the 3 lots. The gains were better for the entire period by the lambs receiving the grain during the last 50 to 100 days than when the grain was fed through the entire test. The best average daily gain for the entire period, 0.2 lb., was made when the grain was fed at the rate of 1 lb. daily during the 75 days prior to marketing. The corresponding gains of the lambs in lots 1, 2, and 4 were, respectively, 0.17, 0.19, and 0.18 lb. Lengthening the feeding period by giving the grain only during the latter part of the test allows for the consumption of a larger amount of alfalfa hay and the marketing of lambs when the price is usually highest, in April. The practicability of the procedure is favorably discussed. A fifth lot of lambs pastured for 57 days and then fattened with 1 lb. of grain daily produced a little better gains than the lot similarly fed on grain and hay. The gains during the pasturing period averaged 7.3 lbs. per head.

[Swine feeding experiments at the Illinois Station] (*Illinois Sta. Rpt. 1924*, *pp. 59–70*, *figs. 2*).—The results of tests of the comparative value of

different types of swine and of various protein supplements for pork production are summarized.

Swine type tests favor intermediate pig (pp. 59–69).—Two tests have been conducted by R. J. Laible, S. Bull, and H. H. Mitchell, the first year with 3 types, chuffy, intermediate, and rangy, and in the second year 2 types, very chuffy and very rangy, were added, all being selected from the Poland China breed. In the first trial 20 60- to 70-lb. pigs of each type were hand-fed individually in dry lot until they weighed 225 lbs. In this test the intermediate type produced pork most economically. In the second experiment 20 pigs each of the very chuffy, intermediate, and rangy types were hand-fed in dry lot and 10 pigs each of the chuffy, intermediate, and very rangy types were self-fed in dry lot. The average weights of the pigs at the beginning of this experiment were for the rangy and intermediate types 60 to 80 lbs. and for the very chuffy pigs 50 to 60 lbs. No marked differences in the economy of gains were apparent, although the very chuffy and very rangy pigs made somewhat slower gains than were made by the other types. In both tests the carcasses were judged after killing, and it was found that practically all of the intermediate type pigs were finished and firm at 225 lbs., though some of the chuffy pigs were overfinished, while the carcasses of the rangy pigs were unfinished. The self-fed pigs were in general better finished than the hand-fed pigs of the same type. The rangy hogs dressed about 1 per cent less than those of the intermediate type. The difference was more pronounced with the very rangy type.

The carcasses were cut into the wholesale cuts and then divided into lean, fat, skin, and bone. Comparisons of the different cuts indicated that there were smaller percentages of bacon bellies from the rangy and very rangy types, probably due to a lack of finish, but otherwise the proportion of the high-priced cuts to the whole carcass was similar. Practically all the hams and bacons of the intermediate type were of the highest grade. The hams of the chuffy and very chuffy types would be criticized for a little overfatness, while the rangy and very rangy types were unfinished. The hams of the very rangy type contained 36 per cent more bone than those from the intermediate type. The carcasses of the chuffy pigs showed a larger percentage of fat but less skin and bone than the intermediate pigs, while the rangy pigs showed less fat but relatively more skin and bone than was found in the intermediate animals.

The maintenance requirements for the 3 types, chuffy, intermediate, and rangy, were also determined at 40 to 60 and 200 to 225-pound weights. The maintenance requirements were smaller at both weights for the intermediate type of animal. Chemical analyses of the carcasses were made at different weights and the data tabulated and discussed. A type index for each pig was calculated, based on the percentage the pig filled of the volume of a box just large enough to contain the pig. A considerable overlapping of individual pigs in different classes indicated either that the judgment of type is subject to much error or that the index does not depend on all the factors concerned.

Find meals more economical than tankage (pp. 69, 70).—In tests by R. J. Laible of the possibility of replacing part of the tankage with other proteins in fattening rations for swine on corn, 5 lots of 20 pigs each were self-fed on corn with protein supplements of tankage or tankage plus linseed meal, alfalfa meal, linseed meal and alfalfa meal, and linseed meal and alfalfa hay. The results indicated that the differences in the rates and economy of gains made by the pigs in the different lots were not significant, and additions of linseed-oil meal and alfalfa meal to the corn and tankage ration were found to be economical.

Hog feeding experiments [at the Kentucky Station] (*Kentucky Sta. Rpt. 1924, pt. 1, pp. 21, 22*).—Tests of the value of mineral mixtures and tankage as supplements to corn hogged down gave results very similar to those in the preceding year (E. S. R., 52, p. 470). Four 1-acre plats of corn were again used. The hogs in one lot received no supplements, while the other lots received supplements of a mineral mixture consisting of bone-marrow meal, limestone, and salt (3:1:1); tankage; and a mineral mixture of ground rock phosphate, salt, and limestone (3:1:1), respectively. The tankage gave the largest net returns. The amounts of pork produced per acre were, by the lot receiving corn alone 420 lbs., with the tankage supplement 670, with the bone-marrow meal mineral supplement 630, and with the ground rock phosphate mineral supplement 520 lbs.

[Swine feeding experiments at the Nebraska Station] (*Nebraska Sta. Rpt. [1924], pp. 23, 24, 34, 35*).—The results of the following experiments are briefly reported:

Wheat for fattening pigs.—In studying the feeding value of wheat, 4 lots of 10 92-lb. pigs each were selected for an 80-day test. One lot self-fed on corn and tankage made an average daily gain of 1.29 lbs. and required 403 lbs. of corn and 40 lbs. of tankage per 100 lbs. of gain. A lot self-fed whole wheat and tankage gained 1.37 lbs. daily and required 393 lbs. of wheat and 22 lbs. of tankage. Another lot self-fed ground wheat and tankage made an average daily gain of 1.5 lbs., requiring somewhat less feed than the preceding lot.

Summer pig feeding.—In comparisons of full and limited feeding of swine on Sudan and alfalfa pasture with dry lot feeding, it was found that the full-fed pigs made greater and more efficient gains than those on limited rations. Feeding on pasture produced gains 50 per cent greater than feeding in dry lot, and less feed was required per unit of gain. Adding tankage to full and limited grain rations fed with alfalfa or Sudan grass pasture increased the rate of gain and saved approximately $2 per hundred on the cost of 100 lbs. of gain. The carrying capacity of Sudan grass was greater during the hot weather than that of alfalfa.

Summer hog feeding.—A lot of hogs self-fed on corn and tankage in dry lot for 20 days made an average daily gain of 1.25 lbs. as compared with a gain of 1.4 lbs. made by hogs fed on a similar ration with access to alfalfa pasture. A third lot self-fed on corn alone with alfalfa pasture made an average daily gain of 0.65 lb.

White v. yellow corn for fattening hogs.—Pigs fed yellow corn consumed more and made larger and more economical gains than pigs fed white corn. Intermediate results were obtained with mixtures of white and yellow corn.

Simple mineral supplements for fattening hogs.—In studying the value of mineral supplements, 4 lots of pigs averaging 75 lbs. were fed for a period of 120 days on a ration of corn and tankage. Four other lots were similarly fed corn and alfalfa hay. Mineral supplements consisting of block salt, steamed bone meal, and a mixture of 1 bu. of cob ashes, 5 lbs. of salt, and 8 lbs. of air-slaked lime were used in different lots. None of the mineral supplements increased the rate or efficiency of gain made on the tankage rations, but all increased the rate of gain on the alfalfa hay.

Comparison of white and yellow corn [at the North Platte Substation].—The results of tests in which 8 lots of pigs were fed white corn for comparison with 8 lots fed yellow corn did not show any advantage for either type, the average daily gains being 1.36 and 1.37 lbs. on the 2 rations. It is concluded that where sufficient variety is furnished in the ration, including protein, equal gains should be expected from yellow and white corn.

Sudan grass pasture [at the North Platte Substation].—Six lots of 20 spring pigs were used for comparing Sudan grass pasture with alfalfa pasture. During the early part of the season equal gains were made on both pastures, but when the Sudan grass became less succulent as a result of dry weather larger gains were made on alfalfa. Sudan grass pasture has been found to be an excellent summer forage, but is not equal to alfalfa.

[Feeding experiments with swine at the Pennsylvania Station], M. F. GRIMES (*Pennsylvania Sta. Bul. 196 (1925), pp. 13, 14, fig. 1*).—The results of the following feeding experiments are reported:

Soy beans for fattening swine.—The results of a fattening test on soy beans indicated that soft carcasses resulted from grazing on this crop. The feeding of corn and tankage, however, following the grazing period, served to counteract the softness. Soy beans alone produced unsatisfactory gains.

Fattening rations for swine (dry lot).—Ten lots of 10 pigs each were used for comparing various protein supplements with and without mineral mixtures to shelled corn and ground barley rations during a 112-day experiment. In all lots except those receiving corn and tankage the feed required per unit of gain was less when the minerals were added. A lot receiving shelled corn, oil cake, and a mineral mixture made comparable gains to the lot receiving corn and tankage. Satisfactory gains were made with barley, but the cost was higher than that of the gains made with corn. Additions of middlings to a corn and tankage ration did not prove satisfactory, and Palmo middlings were only slightly superior to the standard product. The mineral mixture used consisted of equal parts of steamed bone meal, salt, and ground limestone.

Improving winter rations for pigs, A. H. KUHLMAN and J. W. WILSON (*South Dakota Sta. Bul. 216 (1925), pp. 24, figs. 6*).—The results of experiments in feeding fall pigs during the winters of 1923–24 and 1924–25 are reported.

Five rations were used in these experiments—yellow corn and tankage self-fed separately; yellow corn and a protein mixture consisting of 50 lbs. of tankage, 25 lbs. of oil meal, and 25 lbs. of chopped alfalfa hay, both self-fed separately; yellow corn and a mixture of 50 lbs. of tankage and 25 lbs. of oil meal, both self-fed, with alfalfa hay in racks; yellow corn self-fed and creamery buttermilk hand-fed twice daily; and yellow corn and tankage, both self-fed, and one-half as much buttermilk as given to the above lot, hand-fed twice daily. Several lots were placed on the different rations.

The results showed that the standard ration of yellow corn and tankage could be materially improved by supplementing it with alfalfa hay and oil meal or buttermilk. The average daily gains made on the standard ration in the two years' experiments were 1.32 and 1.34 lbs., while with the addition of linseed meal and chopped alfalfa hay the average daily gains in the respective years were 1.54 and 1.58 lbs., and the linseed meal and alfalfa hay 1.49 and 1.67 lbs. The average results for the two years showed that 363.19 lbs. of corn and 35.5 lbs. of tankage were required to produce 100 lbs. of gain on the basic ration. The feed required to produce an equal gain on the other rations was 328.83 lbs. of corn, 24.89 lbs. of tankage, and 12.44 lbs. each of linseed meal and chopped alfalfa hay; and 334.69 lbs. of corn, 28.75 lbs. of tankage, 14.38 lbs. of linseed meal, and 5.19 lbs. of alfalfa hay.

The average daily gains made by two lots each on the rations with buttermilk with and without tankage were, respectively, 1.53 and 1.70 lbs. On the former ration 297.54 lbs. of corn and 611.24 lbs. of buttermilk were required per 100 lbs. of gain. On the latter ration 316.98 lbs. of corn, 19.95 lbs. of tankage, and 283.63 lbs. of buttermilk were required to make an equal gain. Similar results were obtained in an experiment conducted in 1920, in which butter-

milk was found to improve a corn and tankage ration. Semisolid buttermilk and powdered buttermilk also improved the basal ration, but the gains did not equal those made when creamery buttermilk was given. In a single trial barley and tankage produced an average daily gain of 1.57 lbs. as compared with 1.33 lbs. on corn and tankage, but somewhat more barley was required to produce 100 lbs. gain. Adding linseed meal and chopped alfalfa to the barley and tankage ration did not appear to improve it.

It is concluded that the addition of alfalfa hay to the standard rations including corn was desirable for winter pork production, since the results showed that the gains made on these rations compared favorably with the expected gains for pork fed during the summer.

Soft pork investigations, J. M. Scott (*Florida Sta. Rpt. 1924, pp. 19–21*).—The results of two feeding experiments with swine in which fish meal, tankage, and linseed meal were compared as protein supplements to corn are briefly reported.

In the first experiment 4 lots of 7 pigs each were selected for a 55-day test. Lot 1 received corn only, whereas 10 per cent of the protein supplements was added to the rations of the other 3 lots. All lots were hand-fed. The average daily gains made were on corn alone 0.16 lb., corn and fish meal 1.52, corn and tankage 1.27, and corn and linseed meal 1.17 lbs.

The second experiment was conducted with 3 lots of 8 pigs each during a 68-day feeding period. All lots received corn with respective supplements of 1.75 lbs. of linseed meal, 1 lb. of fish meal, and 1.5 lbs. of tankage to each 9 lbs. of corn. The average daily gains made with the different protein supplements were 0.33 lb. with linseed meal, 0.87 lb. with fish meal, and 0.57 lb. with tankage.

The results of the two experiments indicated that corn alone was not an economical feed for fattening purposes, while fish meal proved a very desirable supplement. The tankage used, though producing good gains, was of a poor quality. Linseed meal was inferior to both fish meal and tankage.

[Feeding and nutrition experiments with poultry at the Illinois Station] (*Illinois Sta. Rpt. 1924, pp. 83–87*).—The results of the following experiments by H. H. Mitchell and L. E. Card are briefly summarized:

Properly fed chickens thrive in darkness.—Eight lots of 10 White Leghorn chicks each were selected for studying the effect of sunlight and concentrated ultraviolet light on the growth of chickens receiving complete diets and diets lacking in vitamin A. The basal ration consisted of 58 per cent white corn, 24 per cent wheat bran, 15 per cent tankage, and 3 per cent dried yeast. Cod-liver oil was supplied in 4 lots to the extent of 2 per cent of the ration. Four pens, two with and two without cod-liver oil, were kept where all light was excluded, while the others were in ordinary laboratory light. One-half of the pens kept in darkness were exposed daily to ultraviolet light.

All of the chicks not receiving cod-liver oil were dead within 4 weeks, indicating that the first limiting factor in this basal ration was the lack of vitamin A, as vitamin D was supplied to some of the birds by irradiation. The chickens dying also showed symptoms of ophthalmia. The average weights of the birds receiving cod-liver oil, after feeding from May 8, 1923, to February 28, 1924, were 1,480 gm. for those kept in darkness without irradiation, 1,298 gm. for those kept in darkness and irradiated, 1,397 gm. for those kept in ordinary laboratory light with no irradiation, and 1,688 gm. for those kept in the ordinary laboratory light with irradiation. It is pointed out that the remarkable feature of this experiment was that chickens could be grown at nearly the normal rate in practically complete darkness.

Measure basal heat production of chickens.—The first part of this work consisted of devising a formula for the estimation of the surface area of chickens. The formula, which was found to express the surface in a large majority of cases with considerable accuracy, was—

$$S=5.86\ W^{.5}.L^{.6}$$

in which S is the surface in square centimeters, W is the live weight in grams, and L is the distance from the shoulder to the rump in centimeters. The basal heat production per kilogram of body weight and per square centimeter of body surface was determined at intervals from 37 days to 12 months of age for 6 cockerels, 6 pullets, and 6 capons. The results indicated that the basal heat production per square meter of body surface was nearly the same for birds varying in age from 2.5 months to approximately 1 year, but the basal heat production per kilogram of body weight decreased progressively with age. The basal heat production was much greater per square meter of body surface, however, or per kilogram of body weight, in those birds which were approximately 1 month of age. The basal heat production of cockerels was distinctly higher than that of pullets and capons, and the heat production of pullets was greater, especially at the older ages, than that of capons.

Milk's value in poultry ration studied.—The use of various milk products as the main sources of protein for pullets from hatching time was investigated. The pullets receiving dried buttermilk were slightly heavier than the other lots at 14 weeks of age. Condensed and dried buttermilk were more expensive than skim milk or buttermilk in liquid form, but there is very little difference in cost when all must be purchased.

[Experiments with poultry at the Nebraska Station] (*Nebraska Sta. Rpt. [1924], pp. 9, 10, 26, 27*).—Brief results are given of the following experiments:

Poultry house ventilation and construction.—In studying different methods of ventilation and construction for poultry houses, 3 lots of 100 hens each were placed in individual houses 20 ft. square. A brooder stove was used in one house during cold weather to maintain a uniform temperature. Another house was lined with sheet rock and all ventilation was cut off from 4 p. m. to 7 a. m. daily. The third house had no artificial heat or lining and was given standard ventilation. The egg production in the heated house exceeded that in the house receiving normal ventilation by 51 eggs during a 14-day period. The birds in the house lined with sheet rock produced almost the same as the birds in the heated house. The lack of ventilation during the night did not appear to affect production adversely.

A study of the comparative efficiency of various proteins in poultry feeding.—The average results of 37 trials with 12 mature Rhode Island Red hens on a nitrogen-free ration showed that 147 mg. of nitrogen was excreted per kilogram of live weight. When applying this figure in calculating the nitrogen utilization by birds from corn and from casein, marked disagreement was evident in the value of corn for nonmolting and molting individuals. There was a 65 per cent increase of endogenous nitrogen during molting. Trials with nonmolting birds indicated a 64 per cent utilization for the proteins of yellow corn and casein when either feed furnished the sole source of protein in the ration. Considering the extra endogenous nitrogen excretion during molting, the utilization of corn and casein protein by molting birds was calculated at 65 and 69 per cent, respectively. Additions of cystine markedly increased the utilization of proteins from the casein ration.

[Experiments with poultry at the Pennsylvania Station] (*Pennsylvania Sta. Bul. 196 (1925), pp. 28–31*).—The results of experiments are reported in continuation of those previously noted (E. S. R., 52, p. 272).

The effect of artificial illumination on Single Comb White Leghorn pullets, P. T. Kistler.—The second year's test of the effect of artificial light in the morning during the winter months is reported. A 13-hour day was maintained for the 2 lots of birds receiving artificial light. One of the lots receiving light and one in an unlighted pen received a protein supplement of coconut-oil meal, dried buttermilk, and minerals, while 2 other pens similarly treated received meat scrap and dried buttermilk. During the first 16 weeks 17.1 eggs per bird more were produced in the lighted pens than in the unlighted ones, while from the seventeenth to twenty-eighth weeks 6.1 eggs per bird more were produced in the unlighted pens.

The effect of various sources of animal protein on the egg production and condition of pullets, P. T. Kistler.—Six pens of 40 White Leghorn pullets each were used for testing the comparative value of the following animal proteins: Coconut-oil meal, dried buttermilk, and bone meal; meat scrap and dried buttermilk; coconut-oil meal, dried buttermilk, and acid phosphate; coconut-oil meal, dried buttermilk, and raw rock phosphate; coconut-oil meal (limited to one-half the amount supplied in the first ration), dried buttermilk, and bone meal; and meat scrap and condensed buttermilk. The three years' trials so far conducted indicate that all pens receiving a milk product produced more eggs at a higher feed cost, but the net returns were greater. Vegetable proteins when combined with minerals may replace a large percentage of the animal protein. Bone meal appears to be superior to acid phosphate or raw rock phosphate.

Incubation studies, P. T. Kistler and P. H. Margolf.—A summary of hatching results of eggs produced by birds receiving animal and vegetable proteins indicated that 7,778 eggs produced from vegetable-protein-fed birds were 79.4 per cent fertile, of which 50.4 per cent hatched. Of 8,086 eggs produced by hens receiving animal proteins, 82.4 per cent were fertile and 50.7 per cent hatched. It thus appears that vegetable proteins do not have a detrimental effect on fertility and hatchability.

To compute the cost of raising a pullet from hatching age to maturity (laying age), M. H. Brightman and P. H. Margolf.—Continuing this study of the cost of raising the pullet from hatching to laying age (E. S. R., 52, p. 273), approximately 1,500 chicks of the heavy breeds and 3,500 White Leghorns were placed on the brooder range during the season. One group of 1,797 chicks consumed during the first 6 weeks an average of 1.14 lbs. of mash, 0.37 lb. of scratch grain, and 3.64 lbs. of milk per bird. The calculated cost of feed and care during this period was 12 cts. per chick. Other groups have indicated costs of 19.6 cts. to 8 weeks of age and 33.6 cts. to 10 weeks of age.

The adequacy of synthetic rations for the growth of chicks, A. G. Hogan, N. B. Guerrant, and H. L. Kempster (*Missouri Sta. Research Bul. 81 (1925), pp. 3–51, figs. 38*).—The results of experiments are reported in which groups of chicks were raised indoors from hatching on synthetic rations, synthetic rations with some natural foodstuffs, and synthetic rations with fractions of the natural foodstuffs. The basic synthetic ration was composed of casein, minerals, cod-liver oil, Crisco, starch, cellulose, and yeast, but during the investigation the cellulose was replaced by agar and the casein partly by meat protein in some of the lots for comparison.

The authors state that a considerable number of chicks were successfully raised on the synthetic diets, but much individual variability was apparent, growth was subnormal, the feathers were ruffled, and nutritional disturbances such as leg weakness were frequent. It is believed that these conditions

were due to a vitamin B deficiency. Direct sunlight for short periods daily was of no apparent benefit. The proteins of the ration were adequate, as no improvement followed the replacement of part of the casein by meat protein. Cellulose and agar appeared to be equally valuable as sources of roughage. The substitution of natural foodstuffs as dried egg yolk, polished rice, or dried ox liver for similar nutrients in the basal synthetic ration was followed by practically normal growth and feathering. The favorable results with egg yolk and liver are attributed to their vitamin B contents.

To study further the properties which the natural foodstuffs contributed to the synthetic ration, these materials were fractionated by means of various solvents, the polished rice with dilute acetic acid and the dried egg yolk and dried liver with ether, 95 and 70 per cent alcohol, and hot water. The additions of all the fractions of the egg yolk to the synthetic diet produced normal growth, but individual fractions did not improve growth particularly and the birds had ruffled feathers. The protein fraction of the liver stimulated the growth rate, but the ruffling of the feathers was apparent. The extract from the polished rice appeared to promote approximately normal growth and feathering.

It is concluded that the results emphasize the importance of adequate amounts of vitamin B, but not as the only important factor in the poultry ration.

Sources of animal protein for laying hens, J. H. Martin (*Kentucky Sta. Bul. 260 (1925), pp. 101–132, figs. 9*).—The results of three series of experiments dealing with the value of various proteins for egg production are given in more detail than those previously noted (E. S. R., 48, p. 172; 52, p. 475). In certain cases repetitions of the experiments are given. In all experiments the birds had the run of equal sized lots well set in blue grass, and grit and oyster shells were available at all times. Mash and skim milk when fed were always available, and no drinking water was given with the latter food.

Varying percentages of meat scrap in the mash.—Lots of 20 White Wyandotte pullets each were given mash containing 5, 10, 15, and 20 per cent of meat scrap during each of the 3 years 1918–19 to 1920–21. The balance of the mash was composed of 50 per cent ship stuff (bran and shorts) and 25 per cent each of corn meal and ground oats. The combined average results for the 3 years indicated that the weights of the birds were satisfactorily maintained in all lots, but as the percentage of meat scrap in the mash increased both the winter and annual egg production increased. The winter egg production of the lots receiving 10 and 15 per cent of meat scrap was 28.3 and 27.9 per hen, respectively. It is calculated that with increased percentages of meat scrap in the mash the feed cost increased, but the gross returns and profits per hen also increased.

A comparison of sour skim milk, condensed and dried buttermilk with meat scrap.—Five pens of 20 White Wyandotte pullets each were used for comparing a 20 per cent meat-scrap mash, similar to that fed in the above experiment, with skim milk and condensed buttermilk when fed with and without the basic mash (no meat scrap). A sixth lot receiving 20 lbs. of the basic mash to 8 lbs. of dried buttermilk was included in the second and third years.

Combined results show that the addition of the basic mash to the grain and sour skim milk or condensed buttermilk had no apparent effect in increasing either winter or annual egg production. The pen receiving dried buttermilk for the 2 years had the highest winter and annual egg production of any of the pens. The control pen receiving 20 per cent meat scrap produced the smallest number of winter eggs but had a higher average annual production than the

pens receiving mash with skim milk and condensed buttermilk. The largest estimated profits per hen occurred in the pens receiving meat scrap and skim milk without mash. The high feed costs in the lots receiving condensed buttermilk lowered the profits. During 2 years 12 birds from each of the lots on the meat-scrap mash and the skim milk-no mash rations were continued for a second year in order to get data on their breeding ability. In the second year the birds receiving skim milk produced more eggs in winter but less throughout the year. There was some decrease in skim milk consumption and an increase in mash consumption as compared with the first-year records. The hatchability of the fertile eggs and the embryonic mortality were similar from the 2 rations.

Grain supplements for skim milk.—Six lots of 20 Barred Plymouth Rock pullets each were used for this test. In 4 lots various grain mixtures were tested as supplements to sour milk, as follows: Corn alone, corn and oats (7:3), corn and wheat (7:3), and corn, oats, and wheat (3:1:1). The fifth and sixth lots were fed for 1 year, the former receiving 1 lb. of granulated buttermilk per lot with a grain mixture of corn and wheat (7:3), while the latter received the same grain ration with a mash consisting of bran, shorts, corn meal, and tankage (4:4:1:1), with skim milk as a drink. The combined results indicated that all the rations were satisfactory for egg production, but when wheat was added the winter and annual production was increased as well as the estimated profits per bird. Oats and granulated buttermilk tended to increase the cost of production. One year's results with a 10 per cent tankage mash and skim milk indicated that this was a good ration for winter production and resulted in the highest annual production and the largest financial profits per bird.

Poultry range versus confinement during winter months (*Kentucky Sta. Rpt. 1924, pt. 1, pp. 16, 17*).—In studying the effect of confinement and range on egg production, Leghorn pullets and yearling hens and Single Comb Rhode Island Red and Barred Plymouth Rock pullets were divided into lots so that some of the birds received access to range while others were confined from November 1 to March 1. Records of the average egg production per bird during this period are reported, and in all except one group of birds (Barred Plymouth Rock pullets) the egg production of the range birds was greater than that of the confined birds. From these results it is concluded that with the mild winter in most parts of Kentucky the best results follow when the laying flock is allowed range during the winter.

A complete ration essential for winter eggs, D. C. Kennard (*Ohio Sta. Bimo. Bul., 10 (1925), No. 9, pp. 175–179*).—The essentials of a successful ration for winter egg production are pointed out as grains, a protein concentrate, minerals, vitamins, and the antirachitic factor. Sources of vitamins and the antirachitic factor, the most likely deficiencies, are noted.

The correlation between sexual maturity and egg production, H. L. Kempster (*Missouri Sta. Research Bul. 78 (1925), pp. 3–16, figs. 2*).—Data obtained from the White Leghorn flock of the station are tabulated and analyzed statistically, showing the seasonal and annual production and age of laying the first egg for the pullets in the six years 1917–18 to 1922–23 (E. S. R., 53, p. 471).

The results indicate the existence of a small but significant negative correlation between the age of laying the first egg and the annual egg production. The correlation of sexual maturity with winter egg production was still more significant but less significant with spring and summer production. Little if any correlation was apparent between the rate of sexual maturity and the

best production of one or two months. It was concluded that the influence of the date of hatching on the age at which birds commenced laying was a matter of flock management.

The relationship between the weight of eggs and the weight of chicks according to sex, M. A. JULL and J. P. QUINN (*Jour. Agr. Research* [*U. S.*], *31* (*1925*), *No. 3*, *pp. 223–226*).—The weights of the eggs of Barred Plymouth Rock and Rhode Island Red pullets and hens have been recorded at hatching and averaged according to those producing males and females. In both breeds, for eggs hatching into both sexes, it was found that the yearling hen's eggs were significantly heavier than the pullet's eggs. The weights of the chicks were also recorded at hatching, and the percentage weight of the egg which the chick constituted was calculated. The results showed that there was no significant difference between the weights of the eggs hatching into males or females, the hatching weights of the male and female chicks, or the percentage of the egg weight which the chick constituted. Thus, the separation of the sexes of chicks on the basis of the egg weights or the chick weights is unreliable.

Effect of dehydration upon the bacterial flora of eggs, G. G. DE BORD (*Jour. Agr. Research* [*U. S.*], *31* (*1925*), *No. 2*, *pp. 155–164*).—This paper reports the results of bacteriological studies of eggs of varying quality, both before and after drying by the spray process and the vacuum drum process. Total bacterial counts were determined on nutrient agar at 37° C. for two days and at 20° for four days, and on bromocresol purple lactose agar at 37° for two days for determination of the total counts and for the acid-producing bacteria. The eggs used consisted of whole eggs graded as firsts and the yolks of eggs of the same grade. Commercial firsts were also placed in the sun and allowed to deteriorate. The tests were also made on the inedible grades, consisting of white rots, spots, and other low-grade types. The effect of storage at approximately 20 to 37° was also determined.

The results of the study indicated that the bacterial content of the dried eggs varied with the quality of the product used and the method of dehydration. The counts of eggs dried by the spray process varied from 350 in good eggs to 1,160,000 in the spots. The variation for the eggs dried by the vacuum drum process for corresponding qualities was 45,000 and 2,400,000, respectively. In general, the yolks showed higher bacterial counts than the whites. Storage tended to decrease the bacterial content of the dried eggs, but one sample prepared from rotten eggs increased from 235,000 to 430,000 in three months' storage at 20°. The odor of poor quality eggs tends to disappear in the dehydrated product.

DAIRY FARMING—DAIRYING

Experiments with the dairy herd, J. M. SCOTT (*Florida Sta. Rpt. 1924*, *pp. 21–23*).—Results of two feeding experiments for milk production are briefly noted.

In the first experiment 8 cows were divided into 2 lots for making a comparison of the value of Napier grass silage and Japanese cane silage. The rations of the two lots of animals were similar except that one received Napier grass silage while the other received Japanese cane silage. The kind of silage furnished each lot was alternated during 4 feeding periods of 28 days each, with 4-day transition periods intervening. During the 4 periods when Napier grass silage was fed a total of 6,659 lbs. of milk was produced as compared with 6,891 lbs. of milk during the 4 periods when Japanese cane silage was furnished.

In another experiment a grain mixture composed of wheat bran, corn meal, cottonseed meal, ground oats, and alfalfa meal (1:1:1:1:0.5) was compared with a mixture of equal parts of 2 commercial dairy feeds, one being low in protein and the other a high protein feed. Two lots of cows were fed during 2 test periods of 28 days each, the type of grain supplied to each lot being alternated. There were produced 2,812 lbs. of milk on the mixed commercial feeds during the 2 feeding periods as compared with 2,627 lbs. of milk on the home prepared ration.

[Experiments with dairy cattle at the Pennsylvania Station], S. I. Bechdel (*Pennsylvania Sta. Bul. 196 (1925), pp. 18, 19, 20*).—The results of two experiments are briefly reported:

Soy-bean hay for milk production.—In continuing the study of the value of soy-bean hay for milk production (E. S. R., 52, p. 275), 10 Holstein cows were used in the trial over a period of 70 days. Of the total milk produced during the test, 51.2 per cent was from cows receiving soy-bean hay. It is concluded that soy-bean and alfalfa hay are of equal value for milk production.

Vitamin B requirement of dairy calves.—In studying the vitamin B requirement of dairy calves, 8 Holstein heifers were put on a ration deficient in vitamin B at an average age of 138 days. The ration consisted of imported dried beet pulp, corn gluten meal, casein, polished rice, cane sugar, cornstarch, and pearled hominy plus a mineral mixture of precipitated chalk, monobasic potassium phosphate, ferric citrate, potassium iodide, and steamed bone meal. Fifteen cc. of cod-liver oil was fed daily. Three animals used as checks were given 30 gm. of marmite yeast daily.

The 4 oldest animals, which were fed the vitamin B deficient ration for 540 days, thrived very well and are considerably above normal in size. The 4 younger animals received the experimental ration for 430 days with similar results. For testing the vitamin B requirement of cattle more severely, 2 Holstein and 1 Jersey calves were allowed milk from cows fed a ration low in vitamin B for 3 months prior to freshening. These calves were over 1 year of age and 2 had never received any marmite, while the third was given marmite continuously for 130 days. The 2 former animals were nearly 100 lbs. under normal weight but were thriving. This work indicates that calves have a vitamin B requirement which is very low, and the possibility of synthesis of this substance by the bacterial flora of the digestive tract is indicated.

Feeding trials with cereal hays, F. W. Woll (*California Sta. Bul. 394 (1925), pp. 59–69, 70, 71, fig. 1*).—The results of three trials in testing the comparative value of cereal hays are given in more detail than was noted in an earlier report (E. S. R., 47, p. 673). The combined results indicated that wheat hay fed as the exclusive ration to dairy heifers produced larger gains in body weight per pound of feed than barley, oat, or rye hay. Of the varieties of wheat hay tested, White Australian proved to be the most efficient, with Sonora ranking second. Rye hay was fairly productive but unpalatable. The effect of the stage of maturity at which the hay was cut on the yield, palatability, and chemical and physical properties is pointed out.

The value of silage in the dairy ration, L. H. Fairchild and J. W. Wilbur (*Indiana Sta. Bul. 297 (1925), pp. 12, figs. 7*).—The results of three comparative tests of the value of rations with and without silage for milk production are given.

Two groups of cows were fed by the double reversal method in each trial, there being 4 cows in each group in 2 of the trials and 3 cows per group in one trial. The periods on each ration were 4 weeks in duration. The feeding was uniform throughout. Silage was given at the rate of 3 lbs. per day

per 100 lbs. live weight, alfalfa at the rate of 1 lb. per day per 100 lbs. live weight when silage was included in the ration and at the rate of 2 lbs. without silage. Grain was given at the rate of 1 lb. for each 3 lbs. of 4 to 6 per cent milk and 1 lb. for each 4 lbs. of 3 to 4 per cent milk.

The results for the 3 trials showed that when the cows were changed from the silage to no-silage rations they lost an average of 26 lbs. in live weight, while the opposite change produced average gains of 16 lbs. During the 28-day feeding periods, there was an average decrease of 16.3 per cent in milk production when the cows received no silage, but in the silage feeding periods there was practically no change, the actual data showing an average increase of 0.1 per cent. An analysis of the rations indicated that the no-silage ration contained considerably more protein than the ration containing silage, and that both rations furnished the approximate requirements for total digestible nutrients.

The course of skeletal growth in the dairy cow, S. Brody and A. C. Ragsdale (*Missouri Sta. Research Bul. 80 (1925), pp. 3-35, figs. 24*).—Twenty-one different body measurements are tabulated, which were made at monthly intervals during growth, for Jersey and Holstein heifers up to five years of age, by C. H. Eckles. The average measurements for each age and the monthly increases are graphically presented, including smoothed curves constructed from the equation

$$Y = A - Be^{-k\,(t+9.4)}$$

in which Y is the value of the given measurement at any age t, A is the value of the measurement at maturity, k is the monthly percentage decrease in the rate of growth, B is a constant, e is the base of natural logarithms, and 9.4 represents the gestation period.

A comparison of Guernsey sires based on the average "mature equivalent" fat production of the daughters and their dams, C. W. Turner (*Missouri Sta. Research Bul. 79 (1925), pp. 3–47, figs. 8*).—The average butterfat records corrected to the mature equivalent for the daughters of Guernsey sires having 10 or more Advanced Register daughters have been calculated as in previous publications for Holsteins and Jerseys (E. S. R., 50, p. 874; 52, p. 376). The sires were then classified according to the increase of the daughters' production over that of the dams. For making a determination of the relative effect of the dam and sire on the daughters' milk production, the daughters of sires of a common average production were tabulated according to the production of their dams, from which it was calculated that the sire was responsible for 85 per cent and the dam 15 per cent of the production of the daughter. Further studies of pedigrees indicated that sires were better able than dams to transmit their productive ability through their sons to their granddaughters.

Milk and butterfat production of Jersey heifers (*Kentucky Sta. Rpt. 1924, pt. 1, p. 20*).—Studies of production of Jersey heifers making the records which have been listed in the Register of Merit volume for 1922 indicated that the largest number of heifers began tests at 24 months of age, though nearly as many tests were begun at 23, 25, 26, and 27 months. The maximum production was attained by heifers beginning tests at 28 months.

[Experiments in dairying at the Illinois Station] (*Illinois Sta. Rpt. 1924, pp. 97, 98, 107–109*).—The results of various bacteriological investigations by M. J. Prucha are briefly noted.

Find way to cleanliness in machine milking.—Studies of various methods of cleaning milking machines indicated that the best results were obtained

by rinsing each machine immediately after milking with clean water followed by a 2 or 3 per cent solution of an alkali dairy powder. The tube should be allowed to stand in a saturated solution of sodium chloride or other chlorine compound between milkings. The addition of a hypochlorite disinfectant to the salt solution is also desirable. The teat cups and rubber tubes should be thoroughly cleaned at least once weekly.

Bacteria used in fermented drinks are compared.—In comparative studies of the *Lactobacillus bulgaricus* and *L. acidophilus* groups no clear-cut differences between the two were established. The bulgaricus germs were successfully implanted in the intestinal tract of the rat and man.

Pasteurization does not kill certain bacteria.—It has been possible to isolate bacteria from milk which withstand pasteurization at 145° F. for 30 minutes. The resistant types were either streptococci or diplococci but were not true thermophiles, as they would not grow at 55° C., grew very slowly at room temperature, but grew well at from 37 to 45°. The thermal death point was near 74°. These bacteria produce small or pin-point colonies on agar and produce acid in milk, but they probably are not important in the deterioration of pasteurized milk because of their slow growth at the usual temperatures at which milk is kept. Their source was not determined, but circumstantial evidence indicated that neglected milking machines and utensils were responsible.

[Experiments in dairying at the Pennsylvania Station], C. D. Dahle and W. H. Martin (*Pennsylvania Sta. Bul. 196 (1925), pp. 22–25*).—The results of the following experiments with dairy products are briefly reported:

Variation in composition of butter.—Studies of variation in the moisture content of butter taken from different parts of the churn showed differences as great as 1 per cent, thus indicating the necessity of taking a composite sample from each churning as well as samples from several tubs.

Judging the quality of milk by the methylene blue reduction test, sediment test, and bacteria count (plate method).—Three hundred tests of the patrons' milk at the station creamery indicated that the methylene blue test correlated very closely with the bacterial count, but could not replace the plate method for the discrimination of low bacteria milk. In case of clean milk the sediment test also checks with the methylene blue test, but such correlation in general is not so marked.

The effect of methods of homogenization on the quality of ice cream.—The quality of ice cream prepared from mixes not homogenized and from mixes in which the cream or the entire mix was homogenized at 2,500 or 4,000 lbs. pressure indicated that the nonhomogenized mixes gave the lowest overrun, and the largest overrun averaged from cases in which the entire mix was homogenized. Mixes homogenized at 2,500 lbs. pressure produced a greater overrun than homogenization at 4,000 lbs. pressure. The best quality ice cream, however, occurred when the entire mix was homogenized, and the melting resistance was greatest with the highest homogenization pressure.

A second part of the study of homogenization has dealt with the effect of the two-stage valve in the homogenizer on fresh and aged mixes. The greatest viscosity was obtained by using 3,000 lbs. pressure on one valve only for both aged and fresh mixes. Microscopic studies have indicated that the second valve breaks up the clusters of fat globules produced by the first valve, thus reducing the viscosity. Too high pressure produced mixes which were very thick and viscuous and required a long time to freeze, while too low pressure tended to result in ice cream having a coarse quality.

Viscosity, surface tension, and whipping properties of milk and cream, A. C. Dahlberg and J. C. Hening (*New York State Sta. Tech. Bul. 113 (1925)*,

pp. 3–42, pls. 4, figs. 2).—The effect of the fat content, pasteurization, aging, and temperature on the viscosity, surface tension, and whipping properties of milk and cream has been investigated. The viscosity was determined with an improved MacMichael viscosimeter in a room held at a uniform temperature of from 3 to 4° C., and the MacMichael readings were transposed to centipoises. Surface tension was determined by the Du Nouy apparatus, and the readings were transposed to dynes per centimeter.

Tests of the viscosity of Holstein milk and cream showed that as the fat percentage increased from 0 in skim milk to 35 in cream the viscosity increased in Jersey milk from 2.5 to 63.2 and in Holstein milk from 2.2 to 34.2 centipoises. By holding for 1 day at 3° C. the viscosity of the richer cream of Jerseys was tremendously increased. The cream from the Holsteins increased slightly, but there was practically no increase on the third day. Milk from the same sources was pasteurized at 150° F. for 20 minutes, cooled to 90°, and separated, after which the viscosity of the cream was markedly reduced and there was very little increase with aging. Further tests showed that pasteurization not only reduced the viscosity of the fresh product but inhibited the subsequent increase in viscosity expected with aging. The same results, though possibly more pronounced, were obtained from pasteurizing aged cream. Studies of the differences in the treatment of the cream before separation indicated that the differences in the Holstein and Jersey cream previously noted were due to differences in treatment of the milk before separation. If the milk was held at a low temperature and later separated, its viscosity was much increased. Microscopic examinations showed that this was due to a clumping of the fat globules. By holding pasteurized milk overnight at a low temperaure before separating, a considerable clumping of the fat globules was brought about and the viscosity was much increased. Small modifications in the content of solids not fat of 35 per cent cream did not appear to affect its viscosity.

In the surface tension studies a rather uniform decrease accompanied increases in the percentage of fat. Pasteurization tended to increase surface tension, but this influence was not uniform. An irregular decrease in surface tension appeared to be associated with aging. In the whipping studies aging and a high fat percentage were found to be favorable, while pasteurization was slightly detrimental, but many irregularities occurred which were unexplainable. The volume of whipped cream obtained was apparently adversely affected by all the factors which favor good whipping qualities. The phenomenon of cream whipping is discussed, and it is pointed out that two distinct changes occur during the process, i. e., the incorporation of air and the clumping of the fat. The former process is dependent on the milk proteins, while the latter process is responsible for the stiffness of whipped cream. Surface tension does not appear to be an important factor.

Cleaning milking machines, L. H. Burgwald (*Jour. Agr. Research [U. S.], 31 (1925), No. 2, pp. 191–195*).—A comparison of three different methods of cleaning milking machines was conducted by the U. S. D. A. Bureau of Dairying. Three single units were first rinsed and washed with hot water and a cleansing solution. For further cleaning, one unit was placed in a 5-gal. crock containing a chloride of lime solution for 24 hours, and another unit was similarly treated with a saturated brine and calcium chloride solution, while the third unit was held in hot water at 160 to 165° F. for from 20 to 30 minutes just before milking. The bacterial content of the milk drawn in once a day and twice a day milkings with the machines cleaned in the different ways was compared.

The counts of the milk drawn by the machines held in the hot water for from 20 to 30 minutes were uniformly low both in summer and in winter, the average for 342 samples being 2,380 per cubic centimeter. The chloride of lime with or without the brine produced similar results, but the counts were higher than those from sterilization with hot water, especially in the warm weather. There was practically no difference in the results for once and twice a day milkings. Bacterial counts of the sterilizing solutions in the long milk tubes during cold weather did not indicate any correlation with the period over which the solution had been used or the bacterial content of the milk, but in summer there was a direct relation between the age of the solution and the bacterial content of the milk.

The results indicated that making up new sterilizing solutions of chloride of lime or salt and chloride of lime once weekly during cold weather was sufficient, but that during the warm weather fresh chloride of lime solution should be made up daily and new salt and chloride of lime solution should be made up on alternate days.

The micrococci associated with dairy utensils, A. H. ROBERTSON (*New York State Sta. Tech. Bul. 112 (1925), pp. 3–18*).—The 265 cultures of the genus Micrococcus isolated from milking machines in a previous study (E. S. R., 52, p. 579) have been classified according to the system described in Technical Bulletins 99 to 103 (E. S. R., 52, p. 519). Of the 16 species of micrococci, 11 were represented among those recovered from the milking machines. The species found, given in order of frequency, were *M. candidus, M. conglomeratus, M. epidermidis, M. varians, M. flavus, M. casei, M. aurantiacus, M. freudenreichii, M. luteus, M. albus, and M. aureus.* It was impossible to classify finally 103 of the cultures because of losses. Forty-nine cultures which survived on agar slants after 9 months without transfer were classified. The types found indicated that *M. conglomeratus, M. casei,* and *M. freudenreichii* were among the most resistant. A study of the data in Technical Bulletin 98 (E. S. R., 51, p. 78) indicates that the species most common in milk cans were *M. conglomeratus, M. varians, M. luteus, M. flavus,* and *M. cinnebareus.*

Composition of creamery butter and its control, C. H. ECKLES, J. R. KEITHLEY, and W. B. COMBS (*Minnesota Sta. Bul. 223 (1925), pp. 30, fig. 1*).—The fat and water contents of 2,051 lots of exhibition butter and 1,363 lots of market butter collected in Minnesota are reported. These analyses showed that the fat content was higher and the salt content lower in exhibition butter than in market butter. It was also found that the higher scoring lots of exhibition butter had higher fat contents and contained smaller amounts of salt than the lower scoring lots. It is pointed out that the salt content is apparently the important factor rather than the fat content. Estimations have been made of the losses in Minnesota due to butter containing more than the standard percentages of fat, and directions are given for controlling the composition of butter as manufactured in the creameries as well as for making fat, moisture, and salt tests.

Eleventh annual report of the creamery license division for the year ending March 31, 1925, W. G. GOSS (*Indiana Sta. Circ. 125 (1925), pp. 20, figs. 6*).—This is the usual report (E. S. R., 52, p. 177), and deals with the comparative annual production of dairy products in Indiana, the creamery inspection, and the examination of testers.

VETERINARY MEDICINE

[Investigational work with infectious abortion, avian tuberculosis, and hog cholera] (*Illinois Sta. Rpt. 1924, pp. 70–75, figs. 2*).—Brief reference is first made to work by R. Graham, I. B. Boughton, and E. A. Tunnicliff, during

the past three years, on the merits of abortion vaccine in preventing infectious abortion. Of 10 gilts vaccinated with the living vaccine before being bred in July, 1921, none aborted, while 3 of 11 control gilts aborted. The next year none of 9 gilts vaccinated before breeding aborted, while 1 of 11 gilts not vaccinated aborted. In 1924, 5 gilts which were vaccinated before breeding *farrowed normal litters, and 1 of 13 gilts which were not vaccinated aborted.* The animals in the experiment suffered from hemorrhagic septicemia in 1924, 10 of the vaccinated gilts dying from the disease. It is pointed out that while these results suggest that abortion vaccine will prevent abortion of the infectious type in gilts, it appears that the infection in the herd can not be eliminated *by this treatment. Thus, abortion vaccine is of value only in infected* herds. The vaccine was administered to gilts 8 to 12 weeks old, and at farrowing time *Bacterium abortus* (Bang) was not demonstrated in the fetuses, vaginal discharge, or milk of gilts.

A brief account is given of a study by the same authors of the communica*bility of fowl tuberculosis to* swine and calves to determine what manner of exposure facilitates the spread of this type of the disease to these animals. The investigations at the station, during which healthy pigs were associated with tuberculous chickens, included more than 30 separate experiments, involving the use of 100 healthy pigs and approximately 300 tuberculous chickens. The work resulted in the finding that the disease in chickens is communicated to pigs by (1) a single feeding of *Mycobacterium tuberculosis* (avian), (2) a single feeding of tuberculous organs of fowls, (3) a single intravenous injection of *M. tuberculosis* (avian), (4) the continuous feeding of grain on wooden or dirt floors contaminated with the feces of tuberculous chickens, (5) feeding healthy pigs in a shed where tuberculous fowls had previously been confined, (6) allowing healthy pigs to associate with pigs that had contracted fowl tuberculosis, and (7) a single feeding of tuberculous carcasses of English sparrows. During the time the experiments were conducted in open lots, pigeons and English sparrows were frequently seen feeding with the infected fowls, and autopsies made of sparrows unable to fly that were found near infected pens showed lesions of generalized tuberculosis. The results suggest the possible rôle of English sparrows and other susceptible flying birds in the spread of fowl tuberculosis among pigs and chickens through their feeding habits in rural districts. The examination of tuberculous lymph glands of swine from Illinois farms furnishes some evidence that swine are infected with a type of tuberculosis that is indistinguishable from the fowl type.

An investigation is being conducted by E. Roberts and J. B. Rice with a view to determining whether resistance to hog cholera is inherited. Only 4 offspring from 12 boars and sows naturally immune to cholera have thus far been tested, and of these 1 was found resistant to the disease.

[Disease of livestock investigations at the Kentucky Station] (*Kentucky Sta. Rpt. 1924, pt. 1, pp. 18, 19, 20, 21*).—The isolation and identification of *Encapsulatus genitalium* (*inguinalis*) in the genital tract of mares, where it is the cause of a serious inflammation, is reported. It is considered of particular importance because of its easy transmission by the stallion. This is thought to be the first identification of the organism as the cause of genital infection in mares. Observations during the year are said to show that metritis due to infection is the most common and most serious cause of sterility. Antiseptics have failed to cure the affection, and it is considered to be impossible to effect a cure in the majority of the mares suffering from infectious metritis. Efforts have been directed to methods of prevention. *Streptococcus genitalium* and *E. genitalium* are the two most common and serious forms of infection in the genital tract of mares.

In work with hog cholera, a very small rod coccus was cultivated from extracts from hog tissue, a description of which is presented. A microbe closely resembling this coccus was demonstrated in fresh hog cholera virus. A bacteriophage very active against *Salmonella suipestifer* was isolated from hog feces, and studies are being made of its possible relationship with the hog cholera virus.

[Report of the Montana Station] veterinary department, H. Welch (*Montana Sta. Rpt. 1924, pp. 40–42*).—Reporting upon the work of the year, the author refers to the loss occasioned by an outbreak of abortion in ewes in several parts of the State in 1923, those which aborted that year (E. S. R., 52, p. 483) having been found to lamb normally in 1924; to depraved appetite in cattle, which seemed to be caused by forages deficient in mineral matter; the poisoning of cattle by young cocklebur plants; the use of iodine-salt mixture for the prevention of goiter in young animals; and to the occurrence of the so-called lunger disease of sheep.

Animal diseases [at the Nebraska Station] (*Nebraska Sta. Rpt. [1924], pp. 10, 11*).—A brief reference is made to the work of the year with hemorrhagic septicemia, or fowl cholera, and to the study of the source of tuberculosis of swine. Examinations of 250 consignments of tuberculous hogs, of which 209 permitted of definite conclusions, led to the finding that 88.5 per cent were of avian sources, 5.2 per cent of mammalian sources, and 6.2 per cent of mixed sources.

[Diseases of livestock studied by the Texas Station] (*Texas Sta. Rpt. 1923, pp. 7–9*).—In continuing work with stomach worms of sheep and goats (E. S. R., 49, p. 481), an efficiency of 100 per cent was secured from the administration of 40 cc. of carbon tetrachloride in 120 cc. of caster oil in three of four goats, and 90 per cent in the fourth. In another infested goat 100 per cent efficiency was obtained by the administration of 120 cc. or a 2 per cent solution of Blackleaf 40 in distilled water.

Reference is made to loin disease of cattle, an account of which has been noted (E. S. R., 52, p. 83). A study of the sheep scab mite is under way.

Annual administration reports of the Bombay Veterinary College, Bombay City and Harbour Veterinary Department, and Civil Veterinary Department in the Bombay Presidency (including Sind) for the [years 1923–24 and 1924–25], K. Hewlett, J. D. Buxy, E. S. Farbrother, and J. H. G. Jerrom (*Bombay Vet. Col., City and Harbor Vet. Dept., and Civ. Vet. Dept. Ann. Admin. Rpts. 1923–24, pp. 59+2; 1924–25, pp. 65*).—The occurrence of infectious diseases of livestock during the years 1923–24 and 1924–25 is reported upon, the details being given in tabular form.

The influence of the site of inoculation upon the infectivity of anthrax bacilli and pneumococci for laboratory animals, P. N. Panton and T. H. C. Benians (*Brit. Jour. Expt. Path., 6 (1925), No. 4, pp. 146–157*).—The authors conclude that death following transcutaneous inoculation of anthrax in rabbits does not depend solely upon the soiling of the skin by the needle in passage.

The Bali disease [trans. title], F. Lubberink (*Nederland. Indische Bl. Diergeneesk. en Dierent., 37 (1925), No. 4, pp. 395–402, pl. 1*).—This is an account of a typical disease which occurs among cattle of all ages and both sexes in all districts of the island of Bali. It is thought to be due to fodder or plant poisoning. The disease is characterized by the absence of fever, mummification of the skin in all parts of the body, itching of the diseased spots, nasal and ocular mucopurulent discharge, ulcerative defects of the mucosa underneath the tongue, and more or less pronounced icterus.

Specific infectious cystitis and pyelonephritis of cows, F. S. Jones and R. B. Little (*Jour. Expt. Med., 42 (1925), No. 5, pp. 593–607, pls. 3*).—The authors report upon a specific infection of the urinary tract associated with a diphtheroid organism which has been encountered in cows from three dairy herds in New Jersey. The most characteristic symptom is the frequent passage of turbid or blood-stained urine. The bladder was always found to be involved, the walls being thickened and the mucosa swollen and reddened. Patches of exudate adherent to the bladder mucosa were frequently observed. In certain instances one or both ureters were thickened. In other cases one or both kidneys were involved. The kidney process seemed to originate in the pelvis and extend toward the medulla and cortex. The characteristic bacilli were always found in large numbers in the urinary sediment and the pelves of involved kidneys.

Gastrophiliasis of the horse, P. Larisch (*Die Gastrophiliasis des Pferdes. Inaug. Diss., Univ. Leipzig; Breslau: Tierseuch, Landw. Kammer Schlesien, 1925, pp. 24, pls. 12*).—This is a summary of information on the affections caused by *Gastrophilus* spp. (*equi, pecorum, haemorrhoidalis, nasalis*), in connection with a list of 32 references to the literature.

Resistance of chicks to bacillary white diarrhea, E. Roberts and L. E. Card (*Amer. Soc. Anim. Prod. Proc. 1924, pp. 113–115*).—This is a preliminary report of investigations being conducted at the Illinois Experiment Station by the authors, who point out that losses from bacillary white diarrhea may run as high as from 80 to 90 per cent. In order to discover resistant individuals for use as foundation stock in their study of the inheritance of resistance and susceptibility, 335 day-old chicks were inoculated with a 24-hour culture of *Bacterium pullorum*. Either 0.125 or 0.25 cc. of the culture was given each chick by means of a pipette. A count of one of the cultures gave approximately 16 billion organisms per cubic centimeter. Of 157 Rhode Island Red chicks inoculated, 1, or 0.6 per cent, was resistant, while of 178 White Plymouth Rock chicks, 52, or 29.2 per cent were resistant.

It is pointed out that 49 of the resistant chicks came from a flock which furnished only 68 of the 335 tested, or, in other words, 92.5 per cent of the resistant chicks came from a flock which furnished only 20.3 per cent of the total number tested. The flock containing this large percentage of resistant birds was started in 1904, since which time 2 of 8 or 10 males used each year have been introduced annually from the outside, though not during the last 4 years, as a result of which some inbreeding has resulted. It was found that during the first 12 years considerable bacillary white diarrhea had existed, but during the last 8 it has not been noticed in the flock. It is pointed out that the greater the amount of inbreeding the more rapid is the elimination of the susceptible character.

A bacteriological examination made of 8 of the resistant chicks, at ages varying from 38 to 196 days, failed to detect the presence of *B. pullorum*. Two other resistant chicks at the age of 58 days were again fed 0.5 cc. of a 24-hour culture of *B. pullorum*, and 6 days later examined for *B. pullorum* with negative results. All the remaining resistant chicks were given the agglutination test, with the result that 1 was positive, 10 suspicious, and 35 negative. The remaining resistant chicks are to be mated and the offspring tested for their resistance to this disease.

[Investigations of bacillary white diarrhea and of botulism] (*Illinois Sta. Rpt. 1924, pp. 87–90, figs. 3*).—A brief report is given on studies made by R. Graham, I. B. Boughton, and E. A. Tunnicliff of the efficiency of the macroscopic agglutination test for bacillary white diarrhea. Of 363 flocks containing

41,226 chickens, in 65 counties of Illinois, which had been tested since October, 1923, 5,430, or about 13 per cent, were positive, 2,450, or about 5 per cent, suspicious and regarded as probably infected, and 33,346, or about 80 per cent, negative. In some flocks the infection ran as high as 75 per cent, and only 2 of the 363 flocks tested were found to be free of the disease. A brief reference is made to investigations of the resistance of chicks to bacillary white diarrhea, a preliminary report of which, by Roberts and Card, is noted above.

A brief reference is also made to attempts by Graham, Boughton, and Tunnicliff to prepare a specific antitoxin for type C of *Clostridium botulinum*, the form occurring in domestic animals. An antitoxin of low potency has been prepared from goats and calves by repeated subcutaneous injections of the toxin *C. botulinum*, type C. Experimentally, this type of antitoxin has consistently protected guinea pigs which have been given lethal amounts of the type C toxin. This antitoxin is also of value in identifying the toxin in tests where type C botulism is suspected. Two horses and 2 steers are under treatment, but thus far only a low potency product has been produced.

Intestinal nodules in chickens due to heterakid larvae (Heterakis beramporia Lane), B. SCHWARTZ (*Philippine Jour. Sci., 28 (1925), No. 1, pp. 1–9, pl. 1*).—This is an account of *H. beramporia*, which is frequently met with in chickens in Los Banos, Laguna Province. Nodules in the wall of the ceca were frequently found associated with the presence of adult heterakids in the lumen. A report on microscopic findings by R. J. Formad is included (pp. 6, 7).

Some considerations on the host distribution of parasitic nematodes, H. A. BAYLIS (*Jour. Linn. Soc. [London], Zool., 36 (1924), No. 239, pp. 13–23*).—This is a general discussion of the subject. Lists are given of (1) some nematodes common, as adults, to man and domestic animals, (2) some nematodes common, as adults, to domesticated and wild animals, (3) the genera of nematodes confined to elephants, (4) the genera of nematodes confined to the horse tribe, (5) some nematode genera with restricted range, and (6) some nematode genera with wide range.

AGRICULTURAL ENGINEERING

[Agricultural engineering studies at the Illinois Station] (*Illinois Sta. Rpt. 1924, pp. 174–183, figs. 5*).—Experiments by F. P. Hanson on the control of soil erosion have shown that terraces give satisfactory service when properly built and used.

Plow draft studies on different soil types by R. I. Shawl indicated that the amount of draft varies with the different soil treatments, and that the addition of organic matter to the soil reduces the power required for plowing.

Tests of methods for harvesting soy beans by E. W. Lehmann and I. P. Blauser indicate that at present there is a loss of soy beans ranging from 15 to 45 per cent, depending upon the methods used and the condition of the beans.

Studies by Lehmann and R. C. Kelleher on the factors affecting the design of farm septic tanks have shown that the 2-chamber tank gives the greatest purification of effluent. Better digestion of solids is obtained in the 2-chamber tank, as indicated by sludge accumulation and solids passing out. The 48-hour capacity tank shows a marked improvement over the 24-hour capacity tank. As compared with the 48-hour capacity tank, however, the 72-hour capacity tank showed lower turbidity, lower oxygen consumption, and a smaller rate of sludge accumulation. On the other hand, the 48-hour tank was found to

contain less total sludge, less settleable solids, and less residue on evaporation. These results are considered to indicate the superiority of the 48-hour tank. Considerable improvement in the purification of effluent has been obtained by adding another chamber to still further treat the effluent from a given preceding chamber. Curves of turbidity, residue on evaporation, and settleable solids platted against time show erratic results in the small chambers of the 3-chamber tank. This is considered to be due probably to the fact that the first chamber fills up somewhat and then discharges considerable amounts of floc at one time, thus producing a variation in the quality of the effluent.

The results as a whole are taken to indicate that a 2-chamber tank is more efficient than a 3-chamber or a single chamber tank of equal size under the conditions encountered and with the size of tanks studied. This is thought to be due to the fact that the period during which the sewage remains in each of the two chambers is most favorable to settlement and digestion of solids by bacterial action. In addition the 2-chamber tank has more baffling effect than the 1-chamber tank.

Measurements of the flow of farm sewage from two farm homes at which the average water consumptions were 30.2 and 40.6 gal. per person per day showed that the average sewage flow over a period of 14 days was 37.4 gal. per person per day from the latter.

Studies of different types of electric water systems by Lehmann indicate that the actual efficiency of such plants is low. However, the cost of operating them is so light, and they are so convenient, that the question of efficiency is not considered of great importance when these methods are compared with other methods of pumping. It is considered evident, however, that many plants could be operated with greater economy than at present. It requires from 15 to 25 per cent more power when the range of working pressures is set for from 20 to 50 lbs. than when set for from 10 to 20 lbs. Under practically all conditions the latter range of working pressures has been found to be satisfactory.

Irrigation requirements of the arable lands of the Great Basin, S. Fortier (*U. S. Dept. Agr. Bul. 1340* (*1925*), *pp.* [*1*]+*56, pl. 1, figs. 14*).—Data on the duty of water in the Great Basin collected by the Department during the past 25 years are summarized and discussed.

It is stated that the Great Basin comprises an area of 138,789,000 acres, of which 2,313,165 acres were irrigated in 1920. The crops grown included hay, grain, and potatoes at the higher altitudes, and alfalfa, grain, fruit, corn, and canning vegetables on the arable lands at the lower elevations. The seasonal net water requirements of crops under careful use was found to vary from 1.5 to 2.2 acre-ft. per acre, depending on the locality.

Tests of deep-well turbine pumps, F. L. Bixby (*Jour. Agr. Research* [*U. S.*], *31* (*1925*), *No. 3, pp. 227–246, figs. 16*).—Tests to determine the proper speed of deep-well turbine pumps for various heads and capacities, conducted under a cooperative agreement between the New Mexico Experiment Station and the U. S. D. A. Bureau of Public Roads, are reported in tabular and graphic form.

Algal growths in tank waters and the effect on them of the removal of the dissolved bicarbonates of the water by the addition of sulphuric acid, V. G. Raju (*Indian Jour. Med. Research, 11* (*1924*), *No. 4, pp. 1057–1063*).—It is stated that many of the tank waters in Bengal are rendered unfit for drinking by the growth and subsequent decay of algae. The chief causes of their presence are the accumulation of algal spores and resistant forms in the débris at the bottom and sides of the tank, the presence of bicarbonates in the

tank water, a certain amount of quiescence and transparency in the water, and a suitable atmospheric temperature. Their death and decay are brought about chiefly by the high temperature prevailing in summer.

It has been found that a thorough removal of the soil from the sides and bottom of tanks rids them of algal spores and material serving as their food. The entire removal of the bicarbonates present in the water by the addition of sulfuric acid is also a remedial measure.

The influence of hydrogen ion concentration on the dose of alum and the mechanism of the action of alum in the clarification of natural waters, N. L. BANERJI (*Indian Jour. Med. Research, 11 (1924), No. 3, pp. 695–718*).—Studies are conducted which showed that with other factors, such as suspended matter, size of particles, and concentration of electrolytes remaining constant, the optimum dose of alum for water clarification increases and decreases with the pH, and that total hardness is an important factor in regulating the dose.

The mechanism of the action of aluminum sulfate is divided into two portions due to unhydrolyzed aluminum sulfate and hydrolyzed aluminum sulfate. The positive aluminum ion from the unhydrolyzed portion is the most potent factor in clarification. The dose of alum can be decreased by the preliminary addition of sulfuric acid. This is considered to be very important from the standpoint of economy in water clarification in the case of slow sand filters when the suspended matter in river water is very high.

Some further observations on the species method of differentiating faecal organisms in surface waters in the Tropics, A. D. STEWART and V. G. RAJU (*Indian Jour. Med. Research, 11 (1924), No. 4, pp. 1157–1162*).—Studies are reported which showed that *B. coli communis* is a very common organism in human feces, forming 29 per cent of the fecal organisms present and 26 per cent of those in septic tank latrine effluents. It is distinctly rarer in cow manure, and forms only 12 per cent of the fecal bacilli. *B. coli communis* is much rarer in waters which have received some natural purification, but is present in all waters subject to typical fecal pollution.

The numbers of *B. coli communis* isolated from stored water were in marked contrast to those obtained from human feces, in spite of the fact that several of the samples examined had only a short period of storage. *B. coli communis* formed only 8 per cent as against 29 per cent in human feces, 26 per cent in septic tank latrine effluents, and 20 per cent in typically polluted river water. *B. neapolitanus* formed 37 per cent as against 32 per cent in crude human feces and 28 per cent in latrine effluents. This is taken to indicate that this organism is not adversely affected by storage, and consequently is found in stored waters in equal or greater number than in freshly polluted waters or crude human feces.

B. coli communis was not found at all in any of the waters subjected to prolonged storage, in spite of the fact that it was a predominating organism at the start. *B. coscoroba* formed only 3 per cent of the organisms isolated from human feces, whereas in the case of cow manure it formed 20 per cent.

The results of the examination of septic tank latrine effluents showed a close parallelism to those of human feces in important respects. These results are taken to indicate that the numerical proportion of the main fecal organisms is not materially altered in the course of the passage of the effluents through a septic tank. The storage and natural purification of polluted waters on the other hand caused certain important changes to take place in the fecal flora and tended to alter the relative proportion of the different varieties originally present.

Public Roads [November, 1925] (*U. S. Dept. Agr., Public Roads, 6 (1925), No. 9, pp. 185–212+[2], figs. 20*).—This number of this periodical contains a tabulation of highway research projects and the status of Federal-aid highway construction as of October 31, 1925, together with the following articles: Progress Report of Skew Arch Tests, by G. W. Davis (see below); Efficiency in Concrete Road Construction, by J. L. Harrison; and Wind Resistance of Motor Vehicles, by L. E. Conrad, (see below).

Progress report of skew arch tests, G. W. Davis (*U. S. Dept. Agr., Public Roads, 6 (1925), No. 9, pp. 185–193, 202, figs. 13*).—The progress results of studies being conducted by the Bureau of Public Roads on the design of reinforced concrete skew arches are reported.

It has been tentatively established that the vertical reactions vary uniformly from a maximum at the obtuse angle of the arch to a minimum at the acute angle. The increase of the vertical reaction at the obtuse angle of the arch varies directly as the angle of skew. The resultant pressures of both the horizontal and vertical components move toward the obtuse angle of the arch with an increase in the skew. The direction of the side thrust is toward the face of the arch at the acute angle, and the intensity increases with the degree of skew.

Wind resistance of motor vehicles, L. E. Conrad (*U. S. Dept. Agr., Public Roads, 6 (1925), No. 9, pp. 203–206, 212, figs. 6*).—The progress results of tests conducted by the engineering experiment station of the Kansas State Agricultural College in cooperation with the Bureau of Public Roads on the resistance of wind at various velocities to a number of standard makes of motor vehicles are reported.

The equations representing the relation between wind resistance and velocity, as derived from the experimental data for each car, are all of the parabolic form expressed by the type $P=CV^a$, in which P is the wind pressure, V the wind velocity, C a coefficient determined experimentally for each car, and a is an exponent also determined experimentally for each car.

The form of the equation is the same for the total and unit resistance, the only difference being in the coefficient, which for the unit resistance is obtained by dividing the coefficient for total resistance by the projected area of the car. The average value of the exponent for the 14 stock cars tested was found to be 2.14. In no case was the value below 2, and in only one of the equations did it equal 2.

Of the cars tested, a Buick touring car was found to have the highest wind resistance and a Ford roadster the lowest. The resistance of open cars did not appear to be consistently higher than that of closed models. The average equation for the unit resistance of cars tested was found to be $P=0.00149\ V^{2.14}$.

Plow draft investigations (*Nebraska Sta. Rpt. [1924], p. 9*).—Studies to determine the effect of soil moisture and compaction on plow draft and on the measurement of soil tilth showed that at low compaction the variation in moisture had very little effect upon plow draft. At higher compaction the draft decreased slightly with each increase in moisture up to about 17 per cent. As the moisture increased from this point, the plow draft increased slightly. The draft increased uniformly with the increase in the degree of compaction, and showed an increase of about 80 per cent from a compaction of 64 lbs. per cubic foot of soil to a compaction of 76 lbs. per cubic foot.

Electricity for Indiana farms, T. E. Hienton (*Indiana Sta. Circ. 127 (1925), pp. 15, figs. 15*).—A brief description is given of some of the uses which are now being made of electricity on Indiana farms, and attention is drawn to the experimental program now being undertaken by the Indiana committee on the relation of electricity to agriculture.

RURAL ECONOMICS AND SOCIOLOGY

[Investigations in agricultural economics at Illinois Station, 1924] (*Illinois Sta. Rpt. 1924, pp. 119, 120, 164–173*).—The results obtained during the year in investigations which are in progress are summarized.

[*Factors which contributed to dairy farming profits*, H. F. Hall and D. Small].—Cost accounting studies were carried on in which 22 dairymen, 12 in the northern part of the State and 10 in the southern, cooperated. The average net income for each of the 22 farms amounted to 6.07 per cent of the capital invested. This may be regarded as 5 per cent interest returned on the investment and 1.07 per cent to represent what the farmer received for his labor, management, and risk, or the farmer's labor may be regarded as $600, the remainder, after deducting this from net farm income amounting to 4.06 per cent of the total capital, which may be expressed as the rate earned on the investment.

[*Farm earnings*, H. C. M. Case, M. L. Mosher, and K. H. Myers].—An analysis was made of records from 233 farms for 1923 in 11 counties of the State, principally to show what factors accounted for differences in farm earnings. The most profitable one-third of the farms made 5 per cent on the investment and returned their operators an average of $1,079 to pay them for their labor. Stated in another way, these most profitable farms paid their operators hired man's wage and 6.55 per cent on the average investment. The least profitable one-third of the farms lacked $917 of paying 5 per cent on the investment and gave the farmer nothing for his labor. The factors causing $1,996 difference in the earnings of the one-third most profitable and the one-third least profitable farms include crop yields, returns from each $100 invested in livestock, the use of man and horse labor, expenses for each $100 gross income, and the size of farm.

[*Cost of production*, H. C. M. Case, E. Rauchenstein, and C. A. Bonnen].—Data were taken in 1923 in Champaign and Piatt Counties, continuing cost of production surveys which have been in progress at this station for 11 years. Information for the single year is reported, and records for the four years 1920–1923 are summarized.

[*Farm power costs*, E. Rauchenstein and R. I. Shawl].—A study of tractor costs for 1921 to 1923 showed that for an average of 40 to 103 farms the average annual cost of operating tractors, after deducting receipts for custom work, was $289.21 in 1921, $236.79 in 1922, and $245.26 in 1923.

[*Economic aspects of cattle feeding*, H. C. M. Case, R. R. Snapp, and R. H. Wilcox].—Approximately 75 farms have been surveyed each year for the past 5 years, and in addition detailed cost account records have been kept of the cattle-feeding operations on about 25 farms during four winters of the period. During the winter 1923–24, records were secured on a total of 4,742 cattle. The net cost of producing 100 lbs. of gain was $15.82. The range in this cost was from an average of $11.57 for calves weighing less than 500 lbs. to $18.30 for heavy steers weighing more than 1,000 lbs. when put on feed. Cattle fed from 75 to 105 days required the smallest margin in order to break even on the cattle-feeding operations, while the necessary margin was high on cattle fed from 135 to 195 days. Partly because of high labor costs the cattle that received little or no silage in the ration showed the largest profit per head. In 1923 a margin of $2.29 a hundred was received on the cattle fed, while the necessary margin to cover all costs was $2.31.

[*Land problems*, H. C. M. Case and C. A. Bonnen].—Records were secured from 470 farmers in McDonough and DeWitt Counties. It is indicated that

tenancy was serving a direct purpose in helping part owners and related tenants to become owners of the land they operated, and that these two groups made up 37 per cent of all farmers in the areas studied. The history of many of the men now owning land indicated that they had begun farming as tenants who were unrelated to the owners of the farms they operated.

A review of the agriculture of the Big Bend Country, B. HUNTER, G. SEVERANCE, and R. N. MILLER (*Washington Col. Sta. Bul. 192 (1925), pp. 5–47, figs. 10*).—Meteorological data have been assembled for the region (see page 312), and average yields on specific farms and in tillage experiments over periods of years are tabulated, including a discussion of the forage problem. Summer fallow practices (see page 316) and the possibilites of livestock production in this section are described.

Factors affecting farm profits in the Williston area, J. E. TURLINGTON and H. G. HAMILTON (*Florida Sta. Bul. 175 (1925), pp. 20, fig. 1*).—A business analysis of 120 farms was made for the year 1923 in Levy County, Fla. Plus-labor incomes were made on 61 per cent of the farms, the average being $807. The average capital invested was $8,111, total receipts $3,087, and expenses $1,712 per farm. Of the receipts, $2,700 was realized from crops, $291 from livestock, and $96 from other sources. Cucumber receipts made up 72.3 per cent of the total.

Farmers with land valued from $40 to $59 per acre made higher labor incomes than farmers with lower priced or higher priced land. The 10 best farms, based on labor income, had more work units, acres in cucumbers, crop acres, capital, receipts, expenses, and a higher crop index on cucumbers than the average, and a labor income of $7,828. Farmers growing crops under contract made an average of $120 per acre on cucumbers and lost an average of $10 per acre on watermelons. Contractors spent $691 and received in return $1,711 per farm.

An index number of farm taxes in Ohio, 1881–1924, inclusive, O. M. JOHNSON (*Ohio Sta. Bimo. Bul., 10 (1925), No. 9, pp. 188, 189*).—Index numbers of Ohio farm taxes have been compiled on the basis of data in the State auditor's reports for 1880 to 1912, inclusive, and in reports of the Ohio Tax Commission for 1913 to 1924, inclusive, a single rural township having been selected from each county. Another index number representing the relative tax burden has been arrived at by dividing the index number of farm taxes by that of farm prices in Ohio. The numbers for taxes in terms of prices are lowest for the years 1880 and 1881. Again, in 1917 and 1918, numbers almost as low appear. In 1896, 1915, and from 1921 to 1924, inclusive, they are particularly high.

The peach industry in the United States: A selected list of references . . ., compiled by L. O. BERCAW (*U. S. Dept. Agr., Bur. Agr. Econ., Agr. Econ. Bibliog. 8 (1925), pp. [2]+35*).—A mimeographed selected list of 202 references on the economic aspects of the peach industry is presented here, including some references relating to Canada. A detailed index is included.

The production and marketing of farm products in Wayne County, Indiana, M. H. OVERTON and P. K. EDWARDS (*Indiana Sta. Bul. 295 (1925), pp. 44, figs. 20*).—Records covering the year March 1, 1923, to March 1, 1924, were secured from railroads, interurban and express companies, the post office, and 240 representative farmers. The kinds and quantities of foodstuffs shipped into and out of the city of Richmond, Ind., were studied, as well as the season of the year in which the shipments were made, the amount of shipped-in farm products consumed in Richmond, and the amount of local production. Also

246 consumer patrons of the city market were interviewed on different days and at different times of the day.

It is concluded that there is a good opportunity for an increased production of apples and peaches in Wayne County as well as for growing such other fruits as grapes, plums, cantaloupes, and watermelons. Local growers have an advantage of over 20 cts. per bushel in supplying the 70,000 bu. of potatoes which heretofore have been shipped in annually from a distance. A few farmers might profitably grow more of certain other vegetables such as cabbage, celery, and beans. Many more colts and sheep and a smaller number of additional beef cattle can be raised profitably in Wayne County. The growing of hogs, dairy cattle, and poultry has been expanded to a point where the need in these lines is for more economical methods of production before there is further expansion. The Wayne County farmers could market their hogs and lambs at more profitable weights and ages and at a time of the year when the price is more favorable.

[**Investigations in marketing at Kentucky Station, 1924**] (*Kentucky Sta. Rpt. 1924, pt. 1, pp. 8–11*).—Tobacco, livestock, and poultry and eggs were found to be produced in the State in larger amounts than used by its population. Hay and concentrated feeds, wool, potatoes, and wheat are shipped into the State. Six different areas were compared on the basis of sales of products from the farms. The cash receipts from farms in the mountainous section were only 20 per cent of those in the blue-grass region. When compared as to gross sales per acre of all land in farms, the mountain region was found to be selling about 18 per cent as much per acre as the blue-grass region. These sections were compared also as to percentage of farm land improved, size of farms, and the value of farm lands per acre.

A survey of the tobacco marketing situation indicated that the production of Burley tobacco has been extended more rapidly than has the market for this type.

Produce dealers and country storekeepers were visited, and information was obtained from them regarding the methods employed in handling and marketing poultry and eggs. Interest was developed in a plan of grading eggs purchased from farmers.

Economic aspects of local potato warehouse organization, J. D. BLACK, B. A. HOLT, and G. M. PETERSON (*Minnesota Sta. Tech. Bul. 28 (1925), pp. 5–76, figs. 17*).—This publication deals with the problems of economic organization of local potato warehouses in Minnesota, the data used having been obtained from a survey made in cooperation with the United States Department of Agriculture in the winter of 1922–23 for the year 1921. The survey included 71 warehouses, of which 33 were line houses, 26 cooperatives, and 12 independents. The classification of costs used in this analysis is on the basis of elementary and process costs, the former including labor, building and site, equipment, office and management, and other direct costs, and the latter including buying; receiving; grading; sacking; warehousing; loading cars; selling; sacks, tags, and twine; and miscellaneous.

Building and site cost represents 13.1 per cent of the total local costs of potato warehouses, as compared with 6.7 per cent for equipment. Site cost represents only 2.1 per cent of building and site cost combined. Building cost per warehouse, under the method of calculating interest and depreciation used in this study, varies with the age of the building, the type of construction, and the size and plan of the building. Building cost per hundredweight of potatoes handled varies with the volume of business handled and is reduced to two factors, including annual cost of building per square (or cubic) foot and hun-

dredweight of potatoes handled per square (or cubic) foot. The average annual cost per square foot for warehouses with basement is 27.2 cts., for those without basements 14.2 cts. The average for line houses is 15.9 cts., for cooperatives 29.4 cts., and for independents 26.6 cts.

Labor costs represent 24.7 per cent of the total. The labor hired is 75.8 per cent of the total labor cost, and that performed by the manager 23.6 per cent. The range is from less than 4 cts. to more than 11 cts. per hundredweight. For all classes combined, over 50 per cent have labor costs between 5 and 7 cts. per hundredweight, 18 per cent are under 5 cts., and 27 per cent are above 5 cts. Relatively more of the line and independent warehouses have costs over 7 cts. per hundredweight, and relatively more of the cooperatives have costs under 5 cts. per hundredweight. The two highest are for cooperative warehouses. These high costs are deemed very serious and must be reduced in most cases if the warehouse is going to succeed.

Office and management cost represents 26.7 per cent of all costs. Of the $1,554 charged to office and management for line houses, $996, or 64 per cent, represents central office costs distributed to the local line houses. A comparison of office and management expenses for the three classes of warehouses shows that they are much higher for line houses than for cooperatives and independents. The items mostly responsible for this are managers' salaries, office salaries, and miscellaneous. The salaries of the local managers of line houses are lower than those of the managers of cooperatives, but to these local salaries must be added $266 as the prorated share in the salaries of management in the central office. The average office and management cost per hundredweight for the 71 warehouses was 6.4 cts., ranging from 1.3 to 17.9 cts. The office and management costs for cooperative and independent warehouses were nearly all under 8 cts. per hundredweight, and for the line houses all were over 8 cts. per hundredweight. The average for cooperatives was 3.6 cts., for independents 4.3 cts., and for line houses 13.1 cts.

A detailed analysis and distribution of the elementary costs to the several processes were not entirely practicable, although some data are included and suggestions are offered indicating roughly the relative importance of the various cost elements in each process and the reasons for variations.

Crops and Markets, [November, 1925] (*U. S. Dept. Agr., Crops and Markets, 4 (1925), Nos. 19, pp. 289–304; 20, pp. 305–320; 21, pp. 321–336; 22, pp. 337–352*).—Current notes are given summarizing information received with reference to the domestic demand, supply, and prevailing prices of agricultural products. Brief summaries of foreign crop and market conditions are presented. The series of index numbers for agricultural exports includes September, 1925.

Monthly Supplement to Crops and Markets, [November, 1925] (*U. S. Dept. Agr., Crops and Markets, 2 (1925), Sup. 11, pp. 345–376, figs. 4*).—Tabulations are presented showing crop conditions, quality, yields, total production, stocks, and acres planted and intended to plant for specific important crops. Weights per measured bushel of wheat, oats, and barley on November 1, 1925, are shown by States. The livestock in the markets at public stockyards and slaughtered, the western livestock and range report of October 1, and the yield and production of animal by-products under Federal inspection are presented, together with statistics of dairy products marketed, cold-storage holdings, fruit and vegetable shipments, and estimates of seed production. Cotton reports include data as to condition, consumption, imports, and prices. Special price reports include corn and hog ratios, 1910–1925; estimated prices received by producers of farm products, October 15, by States, and averages, October 15,

1913–1925, and recent months; index numbers of farm prices; price movements of agricultural products; and the price situation.

Index numbers of production, wages, and prices, J. I. FALCONER (*Ohio Sta. Bimo. Bul., 10 (1925), No. 9, p. 190*).—Index numbers for August have been added to the series previously noted (E. S. R., 54, p. 184).

AGRICULTURAL AND HOME ECONOMICS EDUCATION

Agricultural marketing, J. T. HORNER (*New York: John Wiley & Sons; London: Chapman & Hall, 1925, pp. VIII+249, pls. 2, figs. 46*).—Special emphasis is given to the problems of demand, producing for the market, market wastes, and the economic bases of the marketing services. The chapters in which this material is presented are marketing—its scope and place in economics; standardization of production; preparation for market; storage; transportation; risk as a market cost; selling; financing agricultural marketing; care in producing, handling, and preparing for market; demand; correlation of supply and demand; market information; and market weaknesses and remedies. A brief bibliography is given. Appendixes contain suggestions for special assignments, some statistics showing transportation costs, and the sources of certain food supplies, tabulated and graphically illustrated.

Food: Its composition and preparation, M. T. DOWD and J. D. JAMESON (*New York: John Wiley & Sons; London: Chapman & Hall, 1925, 2. ed., rev., pp. X+177, pl. 1, figs. 42*).—This is a revision of a textbook previously noted (E. S. R., 39, p. 899). This edition presents briefly certain of the results of research with respect to the vitamins.

Principles of clothing selection, H. G. BUTTRICK (*New York: Macmillan Co., 1925, pp. XII+185, figs. 27*).—Designed as a textbook for high school courses in clothing and costume planning, this is intended to encourage the selection of clothing on the basis of aesthetic, hygienic, and economic values.

Art in home economics, compiled by M. E. CLARK ET AL. (*Chicago: Univ. Chicago Press, 1925, pp. X+66*).—This is a briefly annotated list of books and magazine articles on costume design, the history of costume, interior decoration, the history of furniture, architecture, art principles, and art appreciation.

School cottages for training in home-making, J. FORD and B. HALBERT (*Better Homes in Amer. Pub. 9 (1925), pp. 36, figs. 16*).—Questionnaires submitted to practice-house supervisors in the United States and the Philippines yielded information as to the aims and purposes responsible for this development in the teaching of home economics, the types of houses and furnishings used, budgets, and the way in which these houses are conducted. The material reported upon here represents 77 school practice houses and 57 home economics cottages.

Curriculum making in home economics in the Denver schools, K. W. KINYON (*Jour. Home Econ., 17 (1925), No. 3, pp. 148–150*).—For purposes of curriculum analysis a questionnaire was submitted to girls in junior and senior high schools in Denver, Colo., regarding their home activities, the foods occurring in their homes once a day for five days a week and those occurring only three times a week, and the articles of clothing bought ready made, those made at home, and those sometimes bought and sometimes made. From this study it seemed apparent that required work in home economics in the junior high school must place less emphasis upon skill in cookery and clothing construction and more upon the care of the home and sanitation, together with the care and repair of appliances to be used, household and personal laundry, and proper purchasing.

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Home economics surveys in Denver, E. G. JONES (*Jour. Home Econ., 17 (1925), No. 11, pp. 629–634*).—Supplementing the analysis noted above, other questionnaires were sent out to parents asking their opinions as home makers with regard to problems of home relationships, finances, preferred courses in home economics for junior and senior high school girls, and other points. Three required courses, foods in relation to health for grade 7B, clothing choice for grade 7A, and home problems for grade 8B, are determined upon, and electives for grades 8A, 9B, or 9A, and for senior high school are also listed.

FOODS—HUMAN NUTRITION

Vitamin A in beef, pork, and lamb, R. HOAGLAND and G. G. SNIDER (*Jour. Agr. Research [U. S.], 31 (1925), No. 3, pp. 201–221, pl. 1, figs. 23*).—In this contribution from the Bureau of Animal Industry, U. S. D. A., 10 lots of round of beef, 6 lots of pork loins and 1 of pork tenderloin, and 6 of lamb were tested for their content of vitamin A by feeding experiments with rats. The breeding ration for the rats consisted of yellow corn 27.5, oatmeal 20, wheat 25, dried beef 15, dried egg or egg yolk 4, dried yeast 4, calcium carbonate 4, and sodium chloride 0.5 parts, supplemented by cabbage at frequent intervals. In the rations for the vitamin A experiments the meat in most cases furnished all of the protein. Where small amounts were used, dried ox muscle freed as far as possible from vitamin A by extraction with alcohol and ether and heating in a current of air was used in all but 2 cases in which casein purified by heating in shallow layers was used. The ration contained in addition cassava starch, hardened cottonseed oil, and dried yeast. The animals were placed, when about 30 days old and weighing 40 gm. each, on the experimental diet containing the meat to be tested without the preliminary period on a vitamin A-free diet that is the custom in most laboratories. The data obtained are thus complicated by the growth which naturally results from the storage of vitamin A in the animals at the beginning of the experiment, and which would not be inconsiderable owing to the nature of the breeding ration. The meat used was in all cases trimmed free from fat and connective tissues, ground, mixed with water and toluol in the proportion of 800 gm. of meat, 400 cc. of water, and 40 cc. of toluol, and dried in shallow pans in a current of air at a temperature not exceeding 60° C.

Of the beef, 15 and 30 per cent did not furnish sufficient vitamin A for normal growth, while 50 and 95 per cent brought about growth at nearly normal rate in the 4 animals fed each of these amounts. Pork gave even less satisfactory results than beef, 50 and 95 per cent proving inadequate. Irregular results were obtained with the lamb. Three of the 6 samples tested caused no increase in growth when fed at 15 and 30 per cent levels, 1 a fair amount of growth at 30 per cent, and 2 good growth at a 20 per cent level.

In general the data reported substantiate the general opinion that lean meat is a poor source of vitamin A.

Selection of cod-liver oils for medicinal use, J. C. DRUMMOND (*Lancet [London], 1925, II, No. 13, pp. 679, 680*).—In this discussion, which is based upon previously noted investigations (E. S. R., 53, p. 661), attention is called to the fact that cod-liver oils of a pale lemon yellow color are generally of higher medicinal value than colorless oils, as the former come from actively feeding fish, whose livers are rich in vitamins, and the latter from fish during the spawning period, when much of the fat and vitamins has been transferred to the reproductive cells. On the other hand, a dark-brown color indicates that the oil has been made by the old rotting process, during which the vitamin content is reduced by oxidation.

Mushrooms—how to tell whether edible or poisonous, V. K. CHARLES (*Nation's Health, 7 (1925), Nos. 7, pp. 456–459, 510, 518, figs. 4; 8, pp. 542–545, 586, figs. 3*).—In the introduction to this paper the author states that "the all too prevalent belief that certain tests such as peeling, darkening silver, etc., can be used to distinguish poisonous and edible mushrooms has led to many cases of serious poisoning. It can not be too strongly emphasized that there is positively no such test which can be used to differentiate poisonous from edible species of mushrooms. It is necessary that the collector learn to recognize beyond any possibility of error the species he contemplates using as food." With this in mind, the species of edible and poisonous fungi most readily encountered on lawns, by roadsides, and in woods are described and illustrated by photographs.

The health of the runabout child, W. P. LUCAS (*New York: Macmillan Co., 1924, pp. [10]+229, pls. 2, figs. 2*).—In this volume the health of the preschool child is considered from the standpoint of heredity; standards of normal growth and development; problems of hygiene; common diseases, with symptoms and treatment; preventable defects; food and nutrition; and recreation, play, and character training. The chapter dealing with food and nutrition includes a general discussion of the nutritive requirements of children and the causes and signs of malnutrition, together with a balanced diet list for children from 15 to 18 months of age and balanced weekly menus for children 2, 3, 4, 5, and 6 years, furnishing 1,050, 1,135, 1,300, 1,380, 1,490, and 1,600 calories, respectively.

Hydrogen-ion concentration in the gastro-intestinal tract of the albino rat, E. M. ABRAHAMSON and E. G. MILLER, JR. (*Soc. Expt. Biol. and Med. Proc., 22 (1925), pp. 438, 439*).—Adult male rats which had been fed various diets for from 1 to 9 days were killed, and the contents of the stomach and of the upper and lower segments of the small intestines were filtered and the filtrate used for H-ion concentration determinations by the colorimetric method with the Clark and Lubs indicators. The diets used included a standard mixed diet, lean beef, beef fat, boiled potato, the Sherman-Pappenheimer rachitic diet 84, and diet 84 plus 5 per cent of cod-liver oil.

On all but the last two diets the pH values of the stomach and intestines were on the acid side of neutrality, the stomach contents ranging from pH 2.6 to 4.1 and the intestinal from 5.2 to 6.5. On diet 84 the stomach contents were acid, but the H-ion concentration of the intestines was in the neighborhood of pH 7 and in one case even as high as 7.4. The addition of cod-liver oil to the diet for 2 or 3 weeks resulted in a decrease in the pH values of the intestinal contents, the highest value being 5.8. It is suggested that the lowering of acidity of the intestines on a rachitic diet with the resulting formation of insoluble calcium phosphate may be an important factor in the deficiency of calcium absorption and deposition on rachitic diets.

The effect of high protein diets on the kidneys of rats, H. JACKSON, JR. (*Soc. Expt. Biol. and Med. Proc., 22 (1925), pp. 482, 483*).—Rats fed on diets furnishing approximately the same number of calories but a large amount of protein (3.60 to 3.65 gm. per 100 gm. weight daily as compared with 0.97 gm. on a standard stock diet) are said to have grown normally and to have shown no qualitative or quantitative abnormalities in the urine which might have been attributed to the high protein. No clinical signs of nephritis were noted. On autopsy the kidneys were found to be considerably hypertrophied, but showed no lesions in the glomeruli, tubules, or interstitial tissue.

The rôle of fats in vital phenomena, J. B. LEATHES (*Lancet [London], 1925, I, Nos. 16, pp. 803–807; 17, pp. 853–856, figs. 2; 19, pp. 957–962, figs. 22;*

20, pp. 1019–1022).—A series of four lectures dealing with the physiological significance of fats, particularly as concerned with the structure of protoplasmic tissues.

An extract obtained from the external bovine parathyroid glands capable of inducing hypercalcemia in normal and thyreoparathyroprivic dogs, A. M. Hjort, S. C. Robison, and F. H. Tendick (*Jour. Biol. Chem., 65 (1925), No. 1, pp. 117–128, figs. 6*).—In attempts to extract the parathyroid hormone from the external parathyroid glands of the ox, inactive extracts were obtained with all the nonacid solvents tested, but active extracts, as determined by the rise in calcium content of the blood of dogs injected with the preparations, were obtained by extraction of the pulped glands at room temperature with 0.3 per cent hydrochloric acid, 0.3 per cent hydrochloric acid in 40 per cent alcohol, and 0.5 per cent hydrochloric acid in 65 per cent alcohol after treatment of the glands with ether and acetone.

Active extracts were also prepared by boiling the pulped glands with N/10 hydrochloric acid for from 15 minutes to 2 hours, the acetone-desiccated pulped glands with from 0.2 to 0.5 per cent hydrochloric acid for from 15 minutes to 2 hours, and the acetone-desiccated and chloroform-defatted glands with from 0.2 to 1 per cent hydrochloric acid for from 15 minutes to 2 hours. Extraction by boiling with dilute hydrochloric acid is considered preferable to extraction at room temperature. The removal of the lipoidal constituents by preliminary extraction with acetone and ether did not decrease the activity of the final extract, nor was its potency destroyed to any extent by the removal of proteins by neutralization to the isoelectric point and addition of alcohol to a concentration of 80 per cent. In the methods of preparation and the properties of the extract the work confirms that of Collip (E. S. R., 53, p. 563).

Inorganic blood phosphorus and bone ash in rats fed on normal, rachitic, and irradiated-rachitic rations, R. A. Dutcher (*Pennsylvania Sta. Bul. 196 (1925), p. 4*).—The author, with the assistance of M. Creighton and H. Rothrock, has made a systematic study of the content of inorganic phosphorus in the blood and of ash in the femurs at weekly intervals for 8 weeks in three groups of rats fed a normal ration, a rachitic ration, and the same rachitic ration irradiated for 15 minutes with ultraviolet light. In the brief summary reported of the work, it is stated that in the animals on the rachitic ration the phosphorus content of the blood fell very rapidly and the content of ash in the femurs fell rapidly from 40 to 25 per cent. In the normal animals the inorganic blood phosphorus remained at fairly constant level and the bone ash increased steadily. The animals on the irradiated ration did not develop rickets, and the values for phosphorus and bone ash were midway between the other groups. It is concluded that this method may be of use in obtaining quantitative data on the antirachitic value of food materials.

Discussion on influence of sunlight and artificial light on health (*Brit. Med. Jour., No. 3376 (1925), pp. 470–477*).—This symposium on heliotherapy, held by the section of public medicine at the 1925 meeting of the British Medical Association in Bath, includes a general discussion of the subject by L. Hill, a report by G. B. Dixon of his experience in the use of the general carbon-arc-light baths in the treatment of tuberculosis of different types, and a discussion by D. C. Colebrook of the use of light treatment at an infant welfare center.

The treatment at this welfare center is given during the winter months to (1) nursing mothers whose breast milk is failing or whose babies are not thriving, (2) to children up to 2 years of age who are temporarily in the

wards at the center, and (3) to children up to 5 years of age who are attending the center from their own homes. In summing up the general results thus far obtained, the author states that the most striking results have been obtained with the younger babies suffering from simple dietetic troubles, particularly malnutrition associated with vomiting. With older children suffering from general debility, catarrhal conditions, restlessness, irritability, loss of appetite, etc., the light treatment is generally followed almost immediately by marked increase in vigor and loss of irritability and in some cases by improvement in appetite. The results obtained with nursing mothers are said to have been encouraging.

Discussion on the therapeutic value of light (*Brit. Med. Jour., No. 3377 1925), pp. 499–504*).—This report of a symposium, held by the section of therapeutics of the British Medical Association at the meeting noted above, includes papers by W. E. Dixon dealing with the mechanism of the local and general systemic action of light stimulation of the skin and the specific action of light in the prevention and cure of rickets; by C. E. M. Jones on the clinical aspects of treatment by sunlight and artificial light, particularly in nonpulmonary tuberculosis, with a discussion of the selection of different types of lamps for different conditions and of contraindication to light treatment; and by G. H. Lancashire on phototherapy in dermatology; as well as abstracts of the general discussion following these papers.

Light in the prevention of rickets, F. H. HUMPHRIS (*Lancet* [*London*], *1925, I, No. 18, pp. 912, 913*).—A general discussion of the subject.

TEXTILES AND CLOTHING

Laundry research and the textile industry, G. H. JOHNSON (*Textile World, 66 (1924), No. 7, pp. 31, 32, 55*).—The scope of the research on textiles carried on by the Laundryowners' National Association at Mellon Institute and at the American Institute Laundry, Joliet, Ill., is outlined, special consideration being given to table linen, shirting, knit underwear, and hosiery.

The germicidal properties of soap, J. E. WALKER (*Jour. Infect. Diseases, 37 (1925), No. 2, pp. 181–192*).—An extension of the investigation previously noted (E. S. R., 53, p. 609) to studies of the germicidal properties of soaps prepared in the laboratory from known glycerides and of representative soaps purchased in the market is reported, with results confirming those of the previous study that soaps of the higher saturated fatty acids are more strongly germicidal than those of the lower fatty acids, and that soaps are generally more active at 35° C. than at 20°. The most significant finding was that coconut-oil soap was the only soap appreciably active against the typhoid bacillus at ordinary temperatures. The high bactericidal property of this soap is attributed to its high content of saturated fatty acids.

Thorough washing of the hands with any ordinary soap with the formation of a good lather is considered to destroy any adhering diphtheria bacilli, streptococci, and pneumococci and with coconut-oil soap typhoid bacilli. "It is suggested that linseed oil or cottonseed oil used in the manufacture of the official sapo mollis might be advantageously replaced by coconut oil. The greater use of coconut-oil soap would aid in the prevention of the spread of typhoid fever by hand contamination."

Germicidal efficiency of coconut oil and linseed oil soaps and of their mixtures with cresol, F. W. TILLEY and J. M. SCHAFFER (*Jour. Infect. Diseases, 37 (1925) No. 4, pp. 359–367*).—The conclusion noted above that coconut-oil soap has a marked bactericidal power against *Bacillus typhosus* has been

confirmed. Evidence has also been obtained that coconut-oil soap is less efficient against *B. pyocyaneus* and still less against *Staphylococcus aureus*, but more efficient than linseed-oil soap against all three. The bactericidal efficiency of coconut-oil soap was found to be increased by the addition of a slight excess of alkali and of sodium chloride, but the latter addition is of no practical value on account of the tendency to flocculation.

In general the bactericidal efficiency of cresol soap mixtures was greatest in mixtures containing half as much soap as cresol. Saponified cresol solutions containing coconut-oil soap were found to have a greater bactericidal efficiency than those containing linseed-oil soap, and this efficiency was not decreased by the addition of sodium hydroxide in fairly large excess or by the addition of sodium chloride to dilute solutions containing coconut-oil soap. It was found that 21 per cent of coconut oil as soap can satisfactorily replace 28 per cent of linseed oil as soap for holding in solution the 50 per cent of cresylic acid contained in saponified cresol solutions.

The optical behavior of cotton [trans. title], A. HERZOG (*Leipzig. Monatsschr. Textil Indus., 1924, pp. 409–412; abs. in Melliand's Textilber., 6 (1925), No. 4, p. 273*).—The refraction of light by cotton in comparison with other fibers is described, with comment on suitable fixing material for the microscopic observation of cotton fiber. The average light refraction of air-dry cotton is 1.556. As unripe and as dead fiber, cotton is doubly refractive. Studies on the pleochroism of cotton are also reported on.

The influence of ultraviolet light on the strength properties of fiber materials [trans. title], P. HEERMANN and H. SOMMER (*Leipzig. Monatsschr. Textil Indus., 40 (1925), pp. 161–163; abs. in Jour. Textile Inst., 16 (1925), No. 8, p. A266*).—According to a review of important recent investigations on the effect of light on textiles, taken with existing information, damage to the fiber is caused only by light waves of wave length less than 0.36μ. The effect on the fiber is direct and not through the medium of oxygen or ozone. Humidity and size and finish of the fiber are of secondary importance. Some dyes offer a protective influence against light. Silk is the fiber most sensitive to light damage, a loss of 95 per cent of its original strength being recorded after 100 days' exposure to strong sunlight. The authors describe their investigations on fibers and fine yarns wherein a mercury vapor lamp was the source of ultraviolet light. Data on the breaking tension and extension of exposed and unexposed textile materials are tabulated.

A dictionary of silk terms (*New York: Amer. Silk. Jour., 1915, pp. 93, figs. 13*).—This is said to be a "complete and authentic dictionary of the descriptive, commercial, and historical silk terms employed in the silk world, as related to every state of manufactured goods, from the raw silk to the finished broad and narrow silks, including weaves, styles, patterns, woven, printed, and color effects, etc."

HOME MANAGEMENT AND EQUIPMENT

Your home beautiful, L. D. TAYLOR (*New York: George H. Doran Co., 1925, pp. X+13–242, pls. 28, figs. 17*).—A manual for home decorating and furnishing at moderate expense is offered, in which attention is given to color schemes, walls, woodwork, draperies, and furniture and the furnishing of apartments.

The practical book of home repairs, C. FRASER (*New York: Thomas Y. Crowell Co., 1925, pp. XIII+378, pls. 10, figs. 219*).—This handbook is intended to give practical directions for repairs of all kinds in the home.

Home furnishing: Practical and artistic, A. M. KELLOGG, rev. by A. L. BARRINGTON (*New York: Frederick A. Stokes Co., 1924, [2. ed., rev.], pp. XV+*

271, pls. 32).—This volume is arranged in two parts. The first describes in 12 chapters the furnishings and decorations of the various rooms in the house; the second discusses, in general, furniture, floor and wall coverings, curtains, and numerous other features of the house.

Laboratory tests of fuel savers for house heating boilers, F. G. HECHLER (*Jour. Amer. Soc. Heating and Ventilating Engin., 31 (1925), No. 12, pp. 553–556, figs. 2*).—Data from tests made at Pennsylvania State College on the effectiveness of various commercial types of fuel saver for house heating boilers are briefly reported. The conclusion is drawn that the large savings in fuel, labor, etc., sometimes credited to the use of these devices can not be due to any inherent merit of the devices themselves. In the cases where phenomenal savings have followed the installation of fuel savers, the saving has been found to be due to more careful and intelligent operation of the plant, and particularly to a better understanding of the use of the various dampers.

Heating of residences and small buildings, A. G. KING (*Chicago: Domestic Engin. Pubs., 1924, pp. 142, figs. 71*).—Practical information on the heating of residences and small buildings, such as cottages, bungalows, and garages is presented. Chapters are included on heating a cottage by steam, proper main and pipe connections, heating a cottage by hot water, heating a residence by hot water, heating a residence by a vapor system, important details about vapor heating, heating a residence by an air-line system, the proper construction of chimneys, heating a medium-sized garage, heating a private garage, and heating and ventilating small garages.

MISCELLANEOUS

The growth of biology, W. A. LOCY (*New York: Henry Holt & Co., 1925, pp. XIV+481, figs. 140*).—"This volume is an attempt to picture under one view the steps in the growth of our knowledge of organic nature from the Greek foundation to Cuvier in zoology, Hofmeister in botany, and Claude Bernard in physiology."

[**Annual Report of Florida Station, 1924**], W. NEWELL ET AL. (*Florida Sta. Rpt. 1924, pp. 137+XI, figs. 14*).—This contains the organization list, a financial statement for the fiscal year ended June 30, 1924, a general review of the work of the station during the year, and departmental reports, the experimental features of which are for the most part abstracted elsewhere in this issue.

Recent progress in solving some farm problems of Illinois: Thirty-seventh Annual Report [**of Illinois Station, 1924**], H. W. MUMFORD (*Illinois Sta. Rpt. 1924, pp. 196, figs. 45*).—This contains the organization list, a financial statement for the fiscal year ended June 30, 1924, a summary of the principal lines of work, and a list of publications of the year. The experimental work reported and not previously noted is for the most part abstracted elsewhere in this issue.

Thirty-sixth Annual Report of the Kentucky Agricultural Experiment Station for the year 1923, Part II (*Kentucky Sta. Rpt. 1923, pt. 2, pp. [3]+485+16+III, figs. 22*).—This contains reprints of Bulletins 246–251 and of Circular 31, all of which have been previously noted.

Thirty-seventh Annual Report of [**Kentucky Station, 1924, Part I**], T. P. COOPER (*Kentucky Sta. Rpt. 1924, pt. 1, pp. 53*).—Part 1 of this report contains the organization list, a financial statement as to the Federal funds for the fiscal year ended June 30, 1924, a report of the director on the work of

the year, and meteorological data. The experimental work reported and not previously noted is for the most part abstracted elsewhere in this issue.

Abstracts of papers not included in bulletins, finances, meteorology, index (*Maine Sta. Bul. 321* (*1924*), *pp. 165–184+XII*).—This contains the organization list of the station; abstracts of five papers previously noted and of four others abstracted elsewhere in this issue; meteorological observations, noted on page 311; a financial statement for the fiscal year ended June 30, 1924; an index to Bulletins 316–321, inclusive, which collectively constitute the fortieth annual report of the station; and announcements as to the work and publications of the station.

The work of the Montana Experiment Station: Thirty-first Annual Report, July 1, 1923, to June 30, 1924, F. B. LINFIELD ET AL. (*Montana Sta. Rpt. 1924, pp. 72, figs. 24*).—This contains the organization list, a financial statement for the fiscal year ended June 30, 1924, and a report of the director and heads of departments on the work of the station. The experimental work reported and not previously noted is for the most part abstracted elsewhere in this issue.

Thirty-eighth Annual Report of [Nebraska Station, 1924], E. A. BURNETT and W. W. BURR (*Nebraska Sta. Rpt. 1924, pp. 46*).—This contains the organization list, a report of the work of the station, and a financial statement for the fiscal year ended June 30, 1924. The experimental work not previously reported is for the most part abstracted elsewhere in this issue. The text of the Purnell Act is appended.

Thirty-eighth Annual Report of the Pennsylvania Agricultural Experiment Station, [1925], [R. L. WATTS] (*Pennsylvania Sta. Bul. 196* (*1925*), *pp. 42, figs. 6*).—This bulletin discusses briefly the work of the station for the year ended June 30, 1925, including a financial statement for this period. The experimental work recorded is for the most part abstracted elsewhere in this issue.

Thirty-sixth Annual Report [of Texas Station], 1923, B. YOUNGBLOOD (*Texas Sta. Rpt. 1923, pp. 31*).—This contains a report of the director on the work and publications of the station, and a financial statement for the Federal funds for the fiscal year ended June 30, 1923, and for various State funds for the fiscal year ended August 31, 1923. The experimental work reported is for the most part abstracted elsewhere in this issue.

Bimonthly Bulletin of the Ohio Agricultural Experiment Station, [November–December, 1925] (*Ohio Sta. Bimo. Bul., 10* (*1925*), *No. 9, pp. 161–191, figs. 6*).—This number contains, in addition to several articles abstracted elsewhere in this issue, the following: W. J. Green, by C. E. Thorne; and Sunlight and Green Clover as Preventives of Leg Weakness of Chicks, by R. M. Bethke, D. C. Kennard, and M. C. Kik (E. S. R., 53, p. 876).

NOTES

Alabama College and Station.—L. T. Wells, dairy specialist in the extension service, has resigned to engage in commercial work. F. W. Burns has been transferred from resident instruction to the extension service as general livestock specialist, and has been succeeded as assistant professor of animal husbandry by W. E. Sewell. D. G. Sturkil has been appointed assistant professor of agronomy.

California University and Station.—Steps are being taken for the formation of what is to be known as the California Economic Research Council. The general object in view is that of coordinating the research now being carried on in the State by a considerable number of such agencies as banks, private statistical organizations, and others, in addition to the University of California and Stanford University.

Dr. R. H. Smith, entomologist at the Twin Falls, Idaho, Substation, has been appointed assistant entomologist at the Citrus Experiment Station for research in methods of control of the purple scale on citrus.

Georgia Station.—Dr. William G. Friedemann, acting chief chemist since August 1, 1925, has been appointed chief chemist. W. L. Brown was appointed assistant chemist, effective November 1, 1925, vice W. A. Morgan, who has been granted a year's leave of absence for graduate work. Marion A. Willis has been appointed assistant agronomist vice R. G. Shands, resigned.

Frank Van Haltern, assistant in plant pathology at the Iowa Station, has accepted the position of associate botanist, beginning February 20. He has been given charge of the plant disease work at Tifton, which is being conducted in cooperation with the Coastal Plain Station.

Illinois University and Station.—Plans are being prepared for a radio station, a gift of $100,000 having been made by B. H. Sullivan for its construction and maintenance.

A new experimental beef cattle feeding plant has been completed. This is a one-story brick and concrete structure containing seven experimental feeding lots, each 20 by 30 ft. and accommodating if desired 20 head of cattle. Ultimately it is planned to connect this plant with the beef cattle barn by the erection of an additional structure.

Iowa College.—The resignation of President R. A. Pearson is announced to take effect September 1, when he will become president of the University of Maryland, succeeding President A. F. Woods, who has accepted an appointment as Director of Scientific Work in the U. S. Department of Agriculture. H. W. Warner, extension professor of soils, has been appointed agricultural editor of the northern division of the soil improvement committee of the National Fertilizer Association. Burt S. Oderkirk has been appointed in charge of dairy husbandry extension work vice C. B. Finley, who has resigned to become field secretary of the Guernsey Breeders' Association, with headquarters at Minneapolis.

Kansas College and Station.—A contract has been let for the construction of two additional units of the greenhouse at a cost of $10,000. These units will provide additional facilities for the departments of botany and agronomy. They will be equipped with refrigeration for temperature control and will

be used in pathologic and agronomic studies, especially those of factors influencing the winterkilling and diseases of winter cereals.

As a result of action taken at a conference of U. S. Department of Agriculture and experiment station workers at the college on March 2 and 3, a committee has been appointed to encourage cooperative experimental work with sorghums between the State stations of the Southern Great Plains and between these stations and several offices of the Bureau of Plant Industry. The personnel of this committee comprises S. C. Salmon, chairman, H. N. Vinall, J. H. Martin, E. F. Chilcott, R. E. Karper, C. P. Thompson, and H. L. Kent.

Drs. J. L. Weimer and H. Fellows, associate pathologists, respectively, in the Office of Cotton, Truck, and Forage Crop Disease Investigations and the Office of Cereal Investigations, Bureau of Plant Industry, U. S. Department of Agriculture, have been detailed to the station. The former will investigate forage crop diseases, especially those attacking alfalfa, while the latter will cooperate with the departments of botany, agronomy, and chemistry in a study of foot rot diseases of wheat.

Dr. Fred A. Shannon has accepted an appointment in the department of history and civics to teach agricultural and industrial history. H. B. Mugglestone, superintendent of the poultry farm, has resigned, effective June 1, to accept a similar position at the University of California.

Kentucky University and Station.—A fruit growers' short course, arranged in cooperation with the State Horticultural Society, was held at the College of Agriculture from December 1 to 4, 1925.

W. S. Meng, inspector in creamery license work, P. H. Senn, microscopist in the department of feed control, and Thomas Baird, assistant in farm management, have resigned. Recent appointments include W. A. Anderson as microscopist, Dr. John F. Bullard as assistant veterinarian, and W. Leonard Rouse as assistant in farm management.

Massachusetts College and Station.—By vote of the board of trustees a tuition fee of $20 per term will be required of students from within the State, beginning with September 1.

J. D. Willard, director of extension service since 1920, has resigned, effective September 1, to become director of continuing education in the Michigan College. S. B. Haskell, director of the station, has also been appointed acting head of the division of agriculture.

A gold medal for exceptional service to agriculture was recently awarded by the State Department of Agriculture to Dr. J. B. Lindsey, head of the department of agricultural chemistry and vice director of the station.

Miss Helen Knowlton has been transferred from instruction work as assistant research professor of home economics under the Purnell Act. Miss Bertha Knight, extension specialist in clothing and home furnishings of the Maryland College, has been appointed assistant extension professor of home economics to fill the vacancy caused by the resignation of Miss Marion L. Tucker.

Other appointments include Dr. Carl R. Fellers, associate professor of food preservation at the University of Washington, as research professor of horticultural manufactures for work under the Purnell Act; J. H. Frandsen as head of the departments of dairy and animal husbandry in the college and station, beginning shortly after April 1; and Orman E. Street, investigator in agronomy, effective April 1.

Minnesota University and Station.—A four-year technical course in agricultural engineering has been established with opportunities for specialization in farm structures, farm machinery, and reclamation. The first year's work will be carried on in the College of Engineering and the remainder in both

that college and the College of Agriculture. The 210 credits for the course are distributed as follows: Machinery and mechanics 34, general science 21, English 9, fundamental agriculture 23, special agricultural science 19, general fundamental engineering 40, agricultural engineering 44, and electives in agricultural engineering 20.

The division of biochemistry has received a research fellowship of $1,000 from the American Dry Milk Institute for a study of the use of skim milk powder in bread. J. L. St. John, on leave of absence from the Washington Station, has been appointed to this fellowship.

The board of regents has allotted $250,000 to the department of agriculture for the erection of a plant industry building. Most if not all of this building will be occupied by the division of biochemistry.

The station is undertaking several new lines of study under the Purnell Act. The division of agricultural economics will investigate the prices and the marketing of farm products, the latter in cooperation with the division of animal husbandry. The organization of farms in the Red River Valley and types of farming and production areas in Minnesota will be studied by the division of agronomy and farm management, while the home economics division will make a quantitative and qualitative study of farm homes in Minnesota, with special emphasis on the influence of the farm upon the management of the home and the life of the family, the relation of diet to blood formation and regeneration, and methods of preparing pork products.

New projects taken up by the station from other funds include the free choice self-feeder method of raising beef calves; the loss of fat in churning sweet cream and methods for its control; the alfalfa weevil, cucumber insects, and greenhouse insects; forest planting; methods of cutting in Norway pine; and volume, growth, and yield studies of birch and aspen in northern Minnesota.

Missouri Poultry Station.—The national egg-laying contest houses have been replaced by 29 new ones. The new buildings are 12 by 14 ft., replacing 8- by 10-ft. houses of the same type.

Despite shortage of funds, work is progressing very satisfactorily on the project for the eradicating of bacillary white diarrhea from certain areas. Nearly 20,000 birds have been tested during the past season under the system employed. Licensed State veterinarians draw the blood samples and are responsible for the removal of all reactors.

Dr. Sivert Eriksen has resigned as pathologist and bacteriologist, effective March 15, to engage in commercial work in Kansas City. Noel Hall has resigned as specialist in poultry extension.

Rutgers University and New Jersey Stations.—The College of Agriculture has been developing short unit courses in agriculture, offering during the past season courses of one and two weeks' duration in tractor operation, poultry feeding, flower gardening, ice cream making, milk testing, livestock feeding, poultry management, dairy bacteriology, forage and pasture crops, marketing, home vegetable gardening, dairy and livestock management, incubation and brooding, and market milk. Diplomas were given to 67 graduates of these short courses February 19.

Robert F. Poole, associate plant pathologist, resigned March 1 to accept a position as plant pathologist at the North Carolina College, and will be succeeded temporarily by Dr. Charles Chupp, assistant extension plant pathologist at Cornell University, who will be on leave of absence beginning April 1.

Earl L. Scovell has been appointed extension specialist in farm forestry, a new position. Half his time will be spent as assistant State forester and the remainder in extension work in advising New Jersey farmers in the

improvement, development, and professional management of their woodlots, the marketing and utilization of the woodlot products, and the proper utilization of the marginal and waste lands.

New Mexico Station.—In order to provide facilities for investigations with range cattle, the station recently purchased a ranch and equipment on the Jornada plains, about 22 miles north of State College. The ranch has two wells, is fenced, and contains about 40,000 acres. A feeding experiment is under way on the range at the present time.

Good progress is being made on the field work in New Mexico in connection with the cooperative range livestock investigation that is being conducted by the Bureaus of Animal Industry and Agricultural Economics, U. S. Department of Agriculture, and the station. This is a regional project taken up after the passage of the Purnell Act.

North Dakota College and Station.—O. J. Weisner has been appointed State agent in poultry in the extension division and instructor in poultry husbandry in the college. J. A. Munro has been appointed to succeed Dr. R. L. Webster as entomologist in the station.

Ohio State University.—C. L. Blackman has been appointed animal husbandry specialist for extension work.

Texas Station.—L. P. Gabbard, from 1923 to 1925 chief of the division of farm and ranch economics but recently associated with the department of agricultural economics of the University of Wisconsin, has returned to his former position. G. L. Crawford, district agent for the extension service, assumed on February 1 the duties of research marketing specialist in the division of farm and ranch economics of the station and is taking up marketing research under the Purnell Act.

Washington College and Station.—A special session of the legislature just closed made appropriations to the college for the completion of James Wilson Hall, the agricultural building, a part of which has remained unfinished for a number of years; the mechanic arts building, which has remained similarly unfinished; a new water system; and a new armory and gymnasium. It also made special appropriations to supplement those received under the millage tax for the coming year, and established a new rate of millage for the educational institutions of the State to run indefinitely and which for the college is an increase of approximately 30 per cent over the present rate. Special appropriations were made for the Irrigation Substation at Prosser and for the cranberry investigations at Long Beach, for apicultural work, and as an offset fund to the Federal Smith-Lever Act appropriations.

Dr. A. L. Melander, entomologist of the station and for 19 years head of the department of zoology in the college, resigned February 1 to accept a position in the department of zoology of the College of the City of New York. He has been succeeded by Dr. R. L. Webster, professor of entomology in the North Dakota College and entomologist in the station.

Association of Land-Grant Colleges.—The fortieth annual convention will be held in Washington, D. C., November 16–18. As a central topic of discussion for the general sessions and as far as possible in the section on agriculture, there has been selected the question of The Responsibilities of the Land-Grant Institutions in the Adjustment of the Agricultural Industry to the Newer Economic Conditions. An open forum will be held at the final general session upon this topic, following which it is announced that opportunity will be given to discuss any appropriate subject.

EXPERIMENT STATION RECORD

Vol. 54 APRIL, 1926 No. 5

During the years 1926 and 1927 three international congresses of direct interest to agricultural science are to be held in North America. The first of these, chronologically speaking, is the International Congress of Plant Sciences, scheduled to meet in Ithaca, N. Y., August 16–23, 1926. The remaining members of the trio are the Fifth International Congress of Soil Science and the Third World's Poultry Congress. Both of these congresses will convene in 1927, the former in June in Washington, D. C., and the latter during July in Ottawa, Canada.

The International Congress of Plant Sciences is to take the place of the Fourth International Botanical Congress, originally planned to meet in London in 1915. Not only will it constitute the first international gathering of this group of workers since the outbreak of the World War, but it will represent the first opportunity ever available in the United States for a general conference of all who are professionally engaged in plant studies. Its scope has been made so broad as to embrace both the fundamental and the applied plant sciences, thereby including a considerable phase of what is commonly regarded as agriculture, horticulture, and forestry. Among the sections authorized may be mentioned those of agronomy, bacteriology, cytology, ecology, forestry, horticulture, physiology, pathology, mycology, and genetics. An invitation program of papers and addresses will occupy about one-fourth of the available time of each section, but this will be supplemented by round tables and informal discussions open to the entire membership, which is to be unrestricted in scope. Further opportunities for individual contact and participation are to be afforded through noncommercial exhibits and provision for excursions and inspection tours.

According to the prospectus of the congress, its primary interest will be with the research and educational aspects of the plant sciences, and the program is being arranged with special reference to the presentation and discussion of research questions. Opportunity will also be afforded, however, for the discussion of matters pertaining to nomenclature or other regulatory aspects of the sciences included, as a preliminary to definite action at a subsequent international congress.

The congress has been arranged by an organizing committee representing the Botanical Society of America, the American Phytopathological Society, and the Ecological Society of America, and the further cooperative interest is announced of the division of biology of the National Research Council and of the American Association for the Advancement of Science. The facilities of Cornell University have been placed at its disposal, and at the time of writing the final arrangements are assuming quite tangible form.

Plans for the 1927 congresses are naturally less fully matured, but definite progress has been made in numerous directions. The soils congress will meet for the first time in the Western Hemisphere, its previous sessions having been held at Budapest in 1908, at Stockholm in 1910, at Prague in 1922, and at Rome in 1924. The United States has been an active participant in the various earlier congresses, and its opportunity to become host is not surprising in view of the great interest manifested by this country in soils investigations for many years. Official approval of the project has recently been expressed by the Federal Government through the enactment on April 3 of a joint resolution authorizing President Coolidge to extend formal invitations to foreign governments to be represented by delegates.

The congress will doubtless consist mainly of specialists from the numerous countries in which soil investigations are carried on in an intensive way. Particular interest in the past has been manifested in the establishment of uniform methods of procedure in the handling of soil problems of like character in all of the countries represented, with the aim of eventually effecting a correlation of the soils of the world. Questions pertaining to the classification of soils are of immediate concern in order to determine what particular soils that have been defined and mapped in one country are equivalent to soils in another.

In the words of former Secretary of Agriculture Gore in recommending Federal action, "the ultimate object of all this work is to obtain an accurate determination of agricultural possibilities throughout the world as reflected by soil types. The holding of such a conference in the United States should prove especially advantageous in promoting this branch of science, since a much larger number of American representatives interested in soil science, both those associated in Federal Government activities and those connected with State colleges and other institutions in work along these lines, would thereby be enabled to participate in the conference and benefit by the exchange of ideas with the leading students of soil problems in foreign nations concerning the latest developments in experimental, educational, and teaching work."

Formal participation of the United States in the Third World's Poultry Congress has also been assured by the passage on April 21 of a joint resolution by Congress accepting an invitation extended by the Canadian Government, authorizing the President to designate official delegates, and providing for the preparation and installation by the Secretary of Agriculture of a suitable national exhibit "portraying in a correlated manner the fundamental features concerning the organization and development of the poultry industry of the United States, including the broad problems of production, distribution, and marketing of poultry and poultry products." The appropriation of $20,000 for this purpose is also authorized by the legislation.

This congress is held triennially under the auspices of the International Association of Poultry Investigators and Instructors, the first meeting having taken place at The Hague in 1921 and the second at Barcelona in 1924. It is expected that about 40 countries will be represented, that large prominence will be given to questions of education and research, and that the specialists of the Federal Department of Agriculture, the agricultural colleges and experiment stations, and others interested in poultry questions will attend in considerable numbers.

Taken collectively, the holding of these three congresses at points accessible to American teachers and investigators bids fair to be of considerably more than routine importance. An exceptional opportunity will be presented to establish contacts with coworkers in foreign lands, as well as for these visitors to become acquainted at first hand with some of the work now in progress within our own institutions. While such gatherings do not always advance the state of knowledge as concretely and extensively as is anticipated, the interchange of ideas and the visualization of viewpoints are usually very helpful and ultimately of great advantage. The fact that the trio of congresses now in prospect are all meeting for the first time in the Western Hemisphere will lend to their proceedings additional interest and significance.

Germany, among the first of the nations to apply science to agriculture in an organized way, has built up a group of experiment stations that have made most important contributions to the subject and is continuing to prosecute agricultural research in many of her universities and elsewhere. It is, however, only in recent years that a movement has been set on foot corresponding to the extension work that has grown so rapidly in this country for carrying the practical results of this research to the farmer. This movement, inaugurated under the title of "circles for agricultural experi-

ments," consists primarily in the formation of groups of neighboring farmers for the purpose of employing at their common expense a scientifically trained agriculturist known as the "experiment leader."

The first German experiment circle was formed in 1921 in central Germany, near Halle. This was followed by similar circles in East Prussia, which have had remarkable development, and have demonstrated their value in bringing the results of research to the practical farmer through a series of carefully selected and supervised cooperative experimental fields.

The first experimental circle in East Prussia was started in 1922 at Frögenau in the District of Osterode. Since then the movement in this province has developed rapidly. In the spring of 1923 there were 16 circles in the province. A year later these had increased to 45 circles, and since the early part of 1925 80 circles have been in operation. These include not only experiment circles of the large landed proprietors but some which are being carried on and participated in by peasant farmers and small landowners. The total area covered by these circles is now nearly 324,000 acres, which is about 5 per cent of the total cultivated area of the province. The individual circles cover areas ranging from 756 to 12,620 acres.

All of the experiment circles in East Prussia are established along lines formulated by the Union of East Prussian Experiment Circles or the Chamber of Agriculture of the Province of East Prussia. The work of all the circles is along the same general lines but modified by local conditions. A few of the circles have not joined the union but work on an independent basis.

That East Prussia has led other parts of Germany in this movement is, perhaps, explained partly by the close touch that the University of Königsberg has maintained with the farming industry, and partly from the necessity for such aid arising from the rather unfavorable climatic and economic conditions with which farming in this section has to contend. There are from six to seven winter months each year, and questions of breeding and feeding of livestock, meadowland cultivation, farm labor, and farm management are of greater importance than in most of the other parts of Germany. The activities of the circles in this province have therefore expanded from small field experiments to the improvement of agriculture not only in regard to technical measures and plant cultivation but to cover all phases of the industry.

The chief work of the experiment leader is in planning and carrying out field experiments on the farms of the cooperating members, covering usually from 50 to 100 such fields a year. Each field is made the subject of a careful study as to its fertilizer requirements, supplemented often by pot experiments designed to answer as far as possible the general questions that may arise. Among these are cited

such problems as supplying part of the nitrogen fertilization for the winter crops in the autumn and how such applications should be divided between the autumn and spring; how much nitrogen fertilization may be given to grain without risk of excessive growth, which may lead to lodging and diminished yield on account of lack of light, and methods of cultivation to prevent this; the best distance apart to drill grain if it is so planted; and how often drill-sown grain should be cultivated and whether such a system of cultivation can be successfully carried out in the short period of vegetative growth in this section.

Another problem of the experiment leader is the determination of the species and varieties of plants which are most productive in the soils of the respective areas and what working of the soil is most suitable for the various crops of this region. Owing to the short season, the harvest and the preparation of the soil for the next crop are, as a rule, forced together into so short a time that the matter is a most important one. Sometimes it is necessary to let the land lie fallow for a year, although it is aimed to avoid this if possible.

Many other problems are being studied, including spacing of plants in the rows, quantity of seed per acre, seed treatments, legume inoculation, soil acidity, pasture and stock feeding, and protein supplements for livestock, as well as feeding experiments for cattle, horses, and swine, and farm labor problems. During the winter the results of the experiments are worked up and plans laid for the coming season.

At first the various experiment circles were associated in a rather loose organization, which was replaced in January, 1925, by the formation of the Union of East Prussian Experiment Circles, including in its membership all individual members of the circles. This union serves as a mean for effective cooperation. Its organs are the managing committees, the assembly of delegates consisting of the managing committee and a delegate from each circle, and the assembly of members. The real administrative agent is the managing committee, which is chosen by the assembly of delegates and consists of a president, a vice president, four associates, and the manager. The president of the Chamber of Agriculture for the Province of East Prussia and the director of the Plant Cultivation Institute of the University of Königsberg have seats and votes in the meetings of the managing committee, the assembly of delegates, and the assembly of members. The members and delegates meet twice a year, with special meetings as needed, views and suggestions being discussed and plans laid for the season's work.

It is the duty of the managing committee to review the experimental reports sent in, and from these to work out general results. It also has the oversight of the experimental plans, which are corrected as to detail, to eliminate errors, and to coordinate the work. The management advises newly formed circles and assists newly appointed leaders with comprehensive suggestions. The submission of experimental plans for approval is expected, especially those of newly appointed leaders.

The union likewise serves its members by obtaining free of cost fertilizers for the experiment fields, as well as the use of machines for cultivation experiments and reduced prices on chemicals of all kinds and seeds for experimental purposes. The reports of experiments are made to the union on blank forms. Regular salaries for the experiment leaders are provided in general, and the circles guarantee for them free board and lodging on one of the farms.

This movement is proving very successful, and its rapid spread throughout Germany is anticipated.

The foregoing article was one of the last to be prepared by Dr. Edward R. Flint, whose sudden death on March 23, 1926, will be widely mourned. Dr. Flint had been associated with the Office of Experiment Stations since 1917 as assistant in experiment station administration, and he had been actively associated with many of the details of its relations with the stations, including the handling of projects and financial statements and the annual visitation of the stations, and with the contacts of the Office with research institutions in foreign countries.

Dr. Flint was a man of marked versatility, and his professional training, experience, and services were of an unusual order. He was born in Boston, Mass., September 8, 1864, graduated from the Massachusetts Agricultural College in 1887, and subsequently received the degrees of Ph. D. from the University of Göttingen in 1892, M. D. from the Harvard Medical School in 1902, and LL. D. from the University of Florida in 1919. He had served as professor of chemistry in the University of Florida from 1905 to 1917, as well as assistant professor of chemistry in the Massachusetts Agricultural College from 1893 to 1899, and for relatively short periods as a chemist in the Massachusetts and Florida Experiment Stations. He had also practiced medicine in several localities, including the Ancon Hospital, Panama, and the Public Health Service in Cienfuegos, Cuba. He had a wide acquaintance and many interests in life. Because of his unusual attainments, his systematic and painstaking habits of work, and his conscientious and assiduous devotion to duty, he occupied a unique place in the Office organization which it will be difficult to fill.

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

Chemistry in modern life, S. A. ARRHENIUS, trans. and rev. by C. S. LEONARD (*New York: D. Van Nostrand Co., 1925, pp. XVI+286, pls. 12, figs. 20*).—The first few chapters of this volume deal with the theoretical and experimental basis of the science of modern chemistry. With this as a foundation, the development is traced of metallurgy in the manufacture of valuable alloys; of the use of silica in the manufacture of glass, pottery, and cement; and of the utilization of ores and fossil fuels, water, and air. This leads to a discussion of the available sources of energy for chemical reactions and the course of chemical processes, followed by more descriptive treatment of the modern manufacture of dyes, perfumes, drugs, cellulose, and rubber. Throughont the volume the anthor emphasizes the drain on raw materials and energy involved in the manufacture of the products of modern civilization, and this is emphasized particularly in the final chapters on chemistry and the bread question and housekeeping with the treasures of nature.

Industrial chemistry: A manual for the student and manufacturer.—I, Inorganic. II, organic, edited by A. ROGERS (*New York: D. Van Nostrand Co., 1925, 4. ed., vols. 1, pp. XX+511+XXIII, figs. 204; 2, pp. [3]+512–1267, pls. 5, figs. 186*).—In the fourth edition of this manual, the subjects treated are for the most part the same as in the previous edition (E. S. R., 43, p. 600). Manufactnring operations involving primarily mineral and inorganic substances are considered in volume 1 and the production of materials of an organic nature in volume 2.

Photo-electricity, H. S. ALLEN (*London and New York: Longmans, Green & Co., 1925, 2. ed., pp. XI+320, pl. 1, figs. 42*).—Attention is called to this volume, which is one of a series of monographs on physics edited by J. J. Thomson and F. Horton, as furnishing a theoretical background for photochemical reactions such as the activation of organic matter by irradiation with ultra-violet light and the many aspects of heliotherapy. Of particular interest in this connection are the chapters on photochemical actions and on physiological effects—phototherapy, the photo-electric theory of vision. A number of references to recent work on the subject are included.

Methods of organic chemistry.—II, Special, edited by J. HOUBEN (*Die Methoden der Organischen Chemie. II, Spezieller Teil. Leipzig: Georg Thieme, 1925, 3. ed., rev. and enl., vol. 2, pp. XXVII+1431, figs. 56*).—A revision of the volnme previously noted (E. S. R., 49, p. 110).

The elements of colloidal chemistry, H. FREUNDLICH, trans. by G. BARGER (*London: Methuen & Co., 1925, pp. VII+210, pls. 2, figs. 25*).—In this volume the author has presented the essential facts and theories to be found in his well-known Kapillarchemie withont the mass of mathematical deductions and numerical data of the larger, more technical volume. The translation into English was undertaken to render the book available as a text for English-speaking students of medicine and technology.

Fundamentals of physical chemistry, A. EUCKEN, trans. by E. R. JETTE and V. K. LAMER (*New York and London: McGraw-Hill Book Co., 1925, pp.*

XXIII+699, figs. 99).—As explained in the translators' preface, this volume represents more than a translation of the second edition of the German text. The subject matter has been supplemented by work unavailable to the original author or which has appeared since the preparation of the second German edition. This material has been incorporated in the form of footnotes and a few insertions in the text, all denoted by asterisks. The sections dealing with solutions and the thermodynamics of solutions have been rewritten from the standpoint of the ideal or perfect concentrated solution.

The physical chemistry of the proteins, E. J. COHN (*Physiol. Rev.*, *5* (*1925*), *No. 3, pp. 349–437, figs. 9*).—This is an extensive review of the literature on the subject, with a bibliography of 366 references.

The isolation of a product of hydrolysis of the proteins hitherto undescribed, S. B. SCHRYVER, H. W. BUSTON, and D. H. MUKHERJEE (*Roy. Soc.* [*London*] *Proc., Ser. B, 98* (*1925*), *No. B 687, pp. 58–65*).—Using the carbamate method suggested by Buston and Schryver (E. S. R., 46, p. 802) and later elaborated by H. L. Kingston and Schryver[1] the authors have isolated from isinglass a base, $C_6H_{14}O_3N_2$, which differs from the other basic products of hydrolysis of the proteins in that it yields a barium carbamate insoluble in water. From various chemical reactions it is thought to be a hydroxy derivative of lysine, having the probable formula $CH_2NH_2CH_2CH_2CHOHCH_2NH_2COOH$. Thus far it has been identified in the hydrolysis products of fish gelatin, isinglass, the alkali-soluble protein of oats, the albumin of cabbage leaf, and the edestin of hempseed, and has been found to be absent from or present only in small traces in the hydrolysis products of gelatin of mammalian origin, casein, fibrin, and egg white.

Some nitrogenous constituents of the juice of the alfalfa plant, IV, V (*Jour. Biol. Chem., 65* (*1925*), *No. 1, pp. 81–95*).—In continuation of studies previously noted (E. S. R., 53, p. 712), two papers are presented.

IV. *The betaine fraction*, H. B. Vickery.—This deals with the examination of the betaine fraction of the juice of the alfalfa plant fractionated essentially as described in the first paper of the series (E. S. R., 52, p. 610). The fraction contained 8.48 per cent of the nitrogen of the protein-free juice of the plant, and nearly 81 per cent of this nitrogen could be accounted for as stachydrine, choline, trimethylamine, and betaine. The relative distribution of these in the fresh and dry plants is as follows: Stachydrine 0.144 and 0.785 per cent, choline 0.0115 and 0.063, trimethylamine 0.0013 and 0.0069, and betaine 0.00095 and 0.0052 per cent, respectively.

V. *The basic lead acetate precipitate*, H. B. Vickery and C. G. Vinson.—The results are reported of a preliminary examination of the nitrogenous substances precipitated by basic lead acetate from the concentrated protein-free of juice of the alfalfa plant, referred to as the alfalfa filtrate in previous studies of the series. The data, while too few to be of more than qualitative importance, indicate the presence in this filtrate of appreciable amounts of adenine, arginine, lysine, stachydrine, aspartic acid, and tyrosine. "It seems possible, therefore, that the bases in this list may have formed components of more complex substances which were precipitated by the reagent. In view of this it is suggested that basic lead acetate should be used as a clarifying reagent for plant extracts with some caution."

The nitrogen distribution and percentages of some amino acids in the muscle of the shrimp, Peneus setiferus (L.), D. B. JONES, O. MOELLER, and C. E. F. GERSDORFF (*Jour. Biol. Chem., 65* (*1925*), *No. 1, pp. 59–66*).—The finely ground muscle of fresh shrimp (*P. setiferus*), extracted at room temperature with 95 per cent alcohol followed by ether, and then dried, was subjected to

[1] Biochem. Jour., 18 (1924), No. 5, pp. 1070–1078.

elementary analysis and to estimations of diamino acids by the Van Slyke method, tyrosine, tryptophane, and cystine colorimetrically, and aspartic and glutamic acids by isolation and gravimetric determination, with the following results:

Percentage composition on the ash and moisture-free basis, C. 52.93, H 6.33 N 16.88, and S 1.55 per cent; nitrogen distribution in percentages of total nitrogen, amide N 8.13, humin N 1.29, cystine N 1.21, arginine N 19.52, histidine N 6.07 and lysine N 8.63; corresponding amino acids in the ash and moisture-free muscle, cystine 1.75, arginine 10.24, histidine 3.78, and lysine 7.6 per cent; amino acids by colorimetric methods, cystine 1.78, tryptophane 1.21, and tyrosine 4.88 per cent; and aspartic and glutamic acids by gravimetric determination, 6.98 and 15 per cent, respectively.

Some spectroscopic observations on cod liver oil, F. W. Schlutz and M. Morse (*Amer. Jour. Diseases Children, 30 (1925), No. 2, pp. 199–209, figs. 4*).—The studies reported were undertaken to discover if possible the connection between the antirachitic properties of cod-liver oil and ultra-violet light.

The experiments of Kugelmass and McQuarrie on the photoactivity of cod-liver oil (E. S. R., 52, p. 668) were first repeated with negative results. A comparison was then made of the absorption spectrum of cod-liver oil with that of cottonseed oil, which is not antirachitic. The former was found to have two shallow absorption bands not shown by the latter. The spectra also showed that cod-liver oil has a much greater capacity than cottonseed oil for absorbing ultra-violet radiations. A concentrate prepared from the unsaponifiable fraction of cod-liver oil by the removal of cholesterol according to the method of Zucker et al. (E. S. R., 47, p. 369) showed greater power of absorbing ultra-violet radiation than the unsaponifiable fraction before the separation of cholesterol, and this in turn was greater than the original oil. The bands in the spectrum of the original col-liver oil were absent from the unsaponifiable fraction.

A comparison of the absorption spectra of cholesterol in ether solution before and after irradiation showed a greater general absorption by the irradiated than the nonirradiated cholesterol, and the presence in the spectrum of the nonirradiated and absence from the irradiated cholesterol of definite absorption bands. The changes in the spectrum and in the melting point of cholesterol on irradiation are thought to furnish evidence that a definite chemical change has taken place in the cholesterol. The fact that activated cholesterol is unstable, while the active factor of cod-liver oil is stable, is thought to point to the probability that the two are not identical.

A practical suggestion arising from these studies is that the disappearance of bands in the absorption spectrum of cholesterol might be used as an index of its antirachitic activity, but it is pointed out that such an index might be applicable only to a pure substance.

Researches on insulin.—I, Is insulin an unstable sulphur compound? J. J. Abel and E. M. K. Geiling (*Jour. Pharmacol. and Expt. Ther., 25 (1925), No. 6, pp. 423–448, figs. 2*).—In an investigation of the chemical properties of insulin, the authors, with the assistance of G. Alles and A. Raymond, have succeeded in separating from commercial insulin evaluated at 12 rabbit units per milligram a fraction testing 40 units or more per milligram, together with three other fractions containing little or no insulin. The method consists essentially in five successive precipitations with N/6 pyridine solution from solution in N/6 acetic acid, solution of the pyridine precipitate in 90 per cent phenol, removal of the active material from the phenol solution by precipitation with ether, absolute alcohol, or distilled water in considerable amounts,

solution of the active material in N/6 acetic acid, precipitation with saturated NaCl, resolution in water containing N/6 acetic acid, and final precipitation with N/6 pyridine.

The most significant property of the active fraction is the presence of sulfur in a remarkably labile combination. Methods of distinguishing the labile sulfur from more stable sulfur are outlined, and evidence is presented that the inert fractions obtained from the insulin contain very little of the labile sulfur, the content of which increases with the hypoglycemic activity of the fraction.

The authors are of the opinion that this labile sulfur is intimately connected with the biochemical operation of the insulin. "It is not our purpose at this time to discuss the mode of action of insulin, but we do, however, wish to point out that if the labile sulfur is a pivotal element of insulin, then we possess in it a sulfur compound of high specificity, and one that plays a paramount rôle in the normal metabolic changes which the carbohydrates undergo during their utilization in the animal economy. In this connection too, the question suggests itself as to what extent, if any, the islets of Langerhans are dependent upon the presence in our food of a special labile sulfur compound, a precursor indispensable for the elaboration of the hormone, in the absence of an adequate supply of which, pathological alterations in the cells of the islets of Langerhans would take place. Should a connection of this nature be ultimately established, there would come to light an important and hitherto unrecognized etiological factor in the causation of diabetes mellitus."

Researches on insulin.—I, Is insulin an unstable sulphur compound? J. J. Abel, E. M. K. Geiling, G. Alles, and A. Raymond (*Science, 62 (1925), No. 1599, pp. 169–171*).—An abridged report of the above.

Studies on the ultrafiltration and electrodialysis of insulin solutions, T. C. Taylor, C. E. Braun, and E. L. Scott (*Soc. Expt. Biol. and Med. Proc., 22 (1925), pp. 453, 454*).—By a combination of electrophoresis and dialysis, the authors have obtained from insulin an active sulfur-containing fraction which is about 100 per cent higher in physiological activity than the insulin from which it was prepared. The active fraction is soluble in 25 per cent sulfuric acid to which an equal volume of alcohol has been added and on standing separates out from this solution in small needle-like crystals.

A simple method for the determination of potassium [trans. title], R. Meurice (*Ann. Chim. Analyt., 2. ser., 7 (1925), No. 6, pp. 161–163*).—The method consists in the precipitation of the potassium with monosodium tartrate in the presence of methyl alcohol. The technique for the determination, which may be made in the presence of magnesia, sulfates, chlorides, and nitrates, consists in dissolving in water a quantity of the potassium salt equivalent to about 0.65 gm. of anhydrous potassium, adding 100 cc. of a saturated solution of monosodium tartrate, followed by an equal volume of methyl alcohol, and allowing it to stand over night. The precipitate is then washed with methyl alcohol diluted with an equal volume of water and then titrated in the presence of phenolphthalein, preferably with the addition of an excess of sodium hydroxide and back titration with an acid of known strength.

The determination of nitrate nitrogen in plants, R. C. Burrell and T. G. Phillips (*Jour. Biol. Chem., 65 (1925), No. 1, pp. 229–234*).—Various modifications of the Devarda alloy method of determining nitrate nitrogen as applied to soils, including the Davisson (E. S. R., 39, p. 610), the Whiting, Richmond, and Schoonover (E. S. R., 44, p. 611), and the Strowd methods (E. S. R., 44, p. 504), were tested on solutions of sodium nitrate in the presence of other nitrogen compounds likely to occur in plant extracts, including ammonium

sulfate, asparagine, and alanine. The first two methods gave inconsistent results in the presence of asparagine, and the third in the presence of ammonia and amide nitrogen.

Two colorimetric methods, the phenol disulfonic acid method of Chamot, Pratt, and Redfield (E. S. R., 26, p. 110) and the modified reduced strychnine method of Scales and Harrison (E. S. R., 52, p. 11) were then tested. The latter was discarded on account of the off-tints developed in the presence of nitrites and other compounds frequently present in plant extracts and the rapid change in color on exposure to light. In working with the phenol disulfonic acid method on plant extracts, three principal difficulties were encountered: (1) Clearing the plant extracts, (2) removing the sugars and other substances tending to char on the addition of the reagent, and (3) overcoming the effect of chlorides. These difficulties were successively overcome (1) by the use of N sodium hydroxide and a 25 per cent solution of lead acetate, (2) by oxidation of the filtrate from the lead acetate precipitate with sodium oxide, and (3) by precipitating the chlorides with saturated silver sulfate solution, followed by N copper sulfate solution, solid calcium hydroxide, and magnesium carbonate to bring down the colloidal silver precipitate.

The technique for the method with these modifications is described in detail, and data are presented showing its accuracy.

A colorimetric method of determining the H-ion concentration of solutions [trans. title], E. Richard (*Ann. Chim. Analyt., 2. ser., 7 (1925), No. 7, pp. 198–201*).—The method depends upon the principle that if to a solution of a given H-ion concentration included within the range of a certain monochromatic indicator is added a small quantity of the indicator, the intensity of the color depends upon the amount of indicator introduced and the ionic strength of the solution. The technique is as follows:

Exactly 20 drops of a suitable indicator solution are added to 10 cc. of the solution to be tested in one tube and to 10 cc. of N/100 sodium hydroxide in another tube. The tubes are shaken, allowed to stand for 2 or 3 minutes, and then compared in a Duboscq colorimeter. If e equals the depth of the acid solution and E that of the base required to produce the same color, the H-ion concentration can be calculated from the formula $\mathrm{pH}=pK+\log \frac{E}{e-E}$ if $\frac{E}{e-E}$ is greater than unity, or $\mathrm{pH}=pK-\log \frac{e-E}{E}$ if less than unity. A table is given of the proper concentrations of seven monochromatic indicators with useful pH ranges from 2.2 to 12, and of the values of pK for each of these solutions.

Direct precipitation of calcium in cows' milk, C. S. Rothwell (*Jour. Biol. Chem., 65 (1925), No. 1, pp. 129–133*).—A method of determining calcium in milk by direct precipitation as the oxalate as in the Kramer-Tisdall method for determining calcium in blood serum (E. S. R., 46, p. 203) is described, and data are presented indicating that with cow's milk the results obtained agree within ±0.5 per cent of the values obtained by the usual gravimetric method. The technique of the determination is essentially as described by Kramer and Tisdall for blood, except that three washings of the precipitate with 2 per cent ammonium hydroxide and ether are employed for the purpose of separating the fat. With human milk the method has not proved reliable, nor were satisfactory results obtained with several other attempted methods of direct precipitation.

The use of the fermentation-reductase test for the grading of milk, E. R. Hiscox and U. Starling (*Jour. Hyg. [London], 24 (1925), No. 2, pp. 164–175*).—A study is reported of the reliability of the methylene blue reductase test as compared with standard methods of counting bacteria and demonstrating

the presence or absence of *Bacillus coli* as a basis for the grading of milk in England. In the English system milk with bacterial counts not exceeding 30,000 per cubic centimeter is graded as of certified standard, between 30,000 and 200,000 as grade A, and above 200,000 per cubic centimeter as ordinary commercial. In the methylene blue test as ordinarily used, milk is graded in four classes, good, average, bad, and very bad according to the length of time before the disappearance of the blue color, 5½ hours, from 2 to 5½ hours, 20 minutes to 2 hours, and 20 minutes or less, respectively.

Of 166 samples of milk placed in class 1 by the methylene blue test, 106 were of certified, 33 of grade A, and 27 below grade A standard. The two systems of demonstrating the presence or absence of *B. coli* in the milk, the production of gas in tubes of bile-salt-lactose broth (English system) and the occurrence of blown curd in the methylene blue test (European system), did not agree. Of 190 samples tested, 92 showed the presence of coliform organisms in the English test and only 37 in the methylene blue fermentation test.

A further comparison was made of the extent of agreement of the bacterial content with the time required for reduction. Of 35 samples having bacterial counts in excess of 500,000 per cubic centimeter, only 13 were correctly placed in the methylene blue scale with respect to both bacterial count and reduction time. Similarly, samples placed in the same group according to the time required for reduction differed widely in their bacterial content.

Attempts to select a reduction time that would be a satisfactory limit for grading milk were unsuccessful. The most that could be said in favor of the reduction test was that if the reduction time was less than 6 hours the sample could be safely regarded as below certified and grade A standards and if more than 16 hours as of certified standard. Between the limits of 6 and 16 hours it is considered impossible to grade the milk with any degree of certainty.

The water content of decolorizing carbons [trans. title], W. MECKLENBURG (*Chem. Ztg.*, *49* (*1925*), *No. 61*, *pp. 429*, *430*, *figs. 2*).—Attention is called to the phenomenon exhibited by certain decolorizing carbons of losing some of their activity on drying. Most commercial carbons contain more or less water, which is present as "original water," i. e., water formed during the process of manufacture of the carbon, as added water, i. e., water taken up from the air by the partly or completely dried material, or as a combination of the two. Data are given showing that commercial carbons containing a rather high percentage of original water may lose their activity on further drying and, therefore, should not be subjected to drying before being tested for their efficiency.

Influence of the water content of active carbons on their decolorizing power, W. MECKLENBURG (*Internatl. Sugar Jour.*, *27* (*1925*), *No. 319*, *pp. 368–370*).—An abridged translation of the above.

METEOROLOGY

International Institute of Agricultural Ecology, R. PIROTTA and G. AZZI (*Internatl. Rev. Sci. and Pract. Agr.* [*Rome*], *n. ser.*, *3* (*1925*), *No. 3*, *pp. 766–781*).—This article gives a brief account of the purpose, membership, organization, network of stations required, and the program of work of the International Institute of Agricultural Ecology, which was inaugurated under the auspices of the Royal National Academy at Rome, June 1, 1923. The principles of agricultural ecology and their application in the study of plant growth are illustrated with results of ecological studies with wheat. The program of work at the central bureau of the institute is stated to comprise the following:

"(1) Agronomy: Determination of the yield of the varieties grown in a district under various conditions of soil and climate, never losing sight of the fact that yield is the result of a relation between productivity and resistance to adverse conditions.

"(2) Plant morphology and physiology: Determination of the physiomorphological characteristics as connected with the expression of economic characters; choice of pure lines in the ecologic sense.

"(3) Genetics: Individualization of the genetic factors which determine the above-mentioned characteristics; crossing of varieties in the ecologic sense.

"(4) Ecology: Determination of the ecological units and production of the best combinations with the object of obtaining the maximum yield."

Climatic conditions and the yield of wheat [trans. title], G. Hoxmark (*Min. Agr. [Argentina], Secc. Propaganda e Informes Circ. 501 (1925), pp. 44, figs. 24*).—Comparing temperature and rainfall conditions and yields of wheat in the wheat-growing region of Argentina during the 12 years 1912–1923, the conclusion is reached that it is possible to estimate with an appreciable degree of certainty the probable yield of wheat by means of meteorological observations made during the winter or the period from April to August, inclusive.

Analyses of rainfall from a protected and an exposed gage for sulfur, nitrate nitrogen, and ammonia, E. M. Johnson (*Jour. Amer. Soc. Agron., 17 (1925), No. 10, pp. 589–591*).—Rain water collected in a gage protected from birds contained slightly more sulfur, less nitrate nitrogen, and much less ammonia than that from a gage not so protected.

Monthly Weather Review, [September–October, 1925] (*U. S. Mo. Weather Rev., 53 (1925), Nos. 9, pp. 379–421, pls. 15, figs. 14; 10, pp. 423–470, pls. 14, figs. 15*).—In addition to detailed summaries of meteorological and climatological data and weather conditions for September and October, 1925, and bibliographical information, notes, abstracts, and reviews, these numbers contain the following contributions:

No. 9.—Some Observations on the Cyclonic Precipitation of February 22–23, 1925, in the Central and Eastern United States (illus.), by R. H. Weightman; Meteorological Aspects of the San Francisco-Hawaii Airplane Flight (illus.), by T. R. Reed; A Further Study of the Relation between Cover Crops and Orchard Temperatures (illus.), by F. D. Young; The Three to a Three-and-One-Half Year Periodic Pressure Oscillation in the Free Atmosphere, by F. Baur, trans. by H. C. Frankenfield; Rainfall Probability during the Fire Season in Western Washington and Oregon (illus.), by T. T. Munger; Record of Dry Spells at Nashville, Tenn., 1871–1925, by R. Nunn; and A New Type of Rain Timer (illus.), by F. N. Hibbard.

No. 10.—Papers on the Relation of the Atmosphere to Human Comfort: The Cooling of Man under Various Weather Conditions by C. F. Brooks, Human Comfort as a Basis for Classifying Weather (illus.) by E. C. Donnelly, The Summer and Winter Weather of Selected Cities in North America (illus.) by G. F. Howe, A Classification of Weather Types by E. S. Nichols, and Weather Types in the Climates of Mexico, the Canal Zone, and Cuba (illus.) by J. E. Switzer; Tornadoes in Alabama (illus.), by W. R. Stevens; The Prediction of Minimum Temperatures for the Red River Valley (illus.), by A. W. Cook; and A Short Method of Determining the Time of Moonrise and Moonset, by F. N. Hibbard.

Meteorological observations at the Massachusetts Agricultural Experiment Station, J. E. Ostrander and J. Bower, jr. (*Massachusetts Sta. Met. Buls. 443–444 (1925), pp. 4 each*).—Summaries are given of observations at Amherst, Mass., on pressure, temperature, humidity, precipitation, wind, sunshine, cloudiness, and casual phenomena during November and December,

1925. The data for November are briefly discussed in general notes. The December number gives an annual summary, from which the following data are taken:

Mean pressure 30.022 in.; mean (hourly) temperature 47.6° F., highest 97° June 7, lowest —13° January 29; total precipitation 44.63 in., snowfall 34.5 in.; cloudiness 2,100 hours; bright sunshine 2,361 hours (53 per cent); prevailing direction of wind, west; total movement 53,311 miles, maximum daily 682 miles February 27; last frost in spring May 26, first in fall September 23; last snow April 20, first October 10.

SOILS—FERTILIZERS

Memoirs on the nomenclature and classification of soils, edited by B. Frosterus (*Memoires sur la Nomenclature et la Classification des Sols. Helsingfors: [Com. Géol. Finlande], 1924, pp. XX+320, pls. 5, figs. 12*).—Reports of the different members of the International Committee of Soil Science relating to the classification of the soils of the different countries in northern Europe are presented as follows: Germany, The Distribution of Soil Types in Germany, by H. Stremme; and Classification and Nomenclature of Soils, by W. Wolff; Austria, Soil Mapping and Classification, by A. Till; Denmark, Nomenclature and Classification of the Soils of Denmark, by J. Andersen; and Agricultural Classification and Description of Danish Soils, by H. R. Christensen; Egypt, Character of the Soil of Egypt, by W. F. Hume; Finland, Soil Formation and Soil Classification, by B. Aarnio; Reaction of Finnish Soils, by W. Brenner; and Classification of Soils and Soil Types of Finland, by B. Frosterus; France, Classification of the Soils of France, by P. Larue; Hungary, Soil Regions in Historical Hungary and the Position of Main Prevailing Soil Types in the General Soil Classification, by P. Treitz; Ireland, Soil Research and the Question of Nomenclature and Classification of Soils in Ireland, by T. Hallisy; Norway, Nomenclature and Classification of the Soil Types in Norway, by K. O. Björlykke; Netherlands, Investigations of the Nomenclature and Classification of the Soils of the Netherlands, Together with Remarks on Methods, by D. J. Hissink; and Investigations of the Nomenclature and Classification of the Soil Types of the Netherlands (Subsoils) from a Purely Petrographic Viewpoint, by P. Tesch; Poland, The Soils as Individuals and Nomenclature and Classification of Soils, both by S. Miklaszewski; Rumania, Considerations concerning the Classification and Nomenclature of Soils, by G. Murgoci; and The Climate as a Factor in the Variation of Types in Zones of Soil, by P. Encoulesco; Russia, Different Soil Types and Their Classification, by C. D. Glinka; Sweden, Classification and Terminology of Swedish Soils, Especially Mineral Soils, Used by the Geological Survey of Sweden, by S. Johansson; and the Genetic System of Organic Formations of Sweden, by L. v. Post; Czechoslovakia, Nomenclature and Classification Used in Soil Studies in Czechoslovakia, by V. Novak; and Wales, Soil Types of North Wales, by G. W. Robinson.

Preliminary treatment of soil with ammonia for the Atterberg sedimentation analysis [trans. title], E. Blanck and F. Alten (*Jour. Landw., 72 (1924), No. 3, pp. 153–162*).—Studies conducted at the University of Göttingen are reported, from which the conclusion is drawn that treatment of soil with ammonia as a preliminary to sedimentation analysis according to the Atterberg method can not be recommended for all soils. A 2.5 per cent ammonia solution was found to have a profound chemical influence on soil, which made the results of sedimentation analysis inaccurate.

Soil survey of the Twin Falls area, Idaho, M. BALDWIN and F. O. YOUNGS (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1921, pp. III+1367–1394, pls. 3, figs. 2, map 1*).—This survey, made in cooperation with the Idaho Experiment Station, deals with the soils of an area of 223,360 acres lying in the southern part of the Snake River Plains area and in the northern part of Twin Falls County in southern Idaho. The greater part of the area consists of a level to rolling plateau or bench. For the most part there is very good natural drainage.

The soils covering the larger part of the area are remarkably uniform in origin, texture, color, and profile, the most important variation being the difference in depth to bedrock. Including rough broken land, rough stony land, and scabland, 12 soil types of 7 series are mapped, of which the Portneuf silt loam covers 83.5 per cent of the area. Irrigation is said to be necessary for successful farming.

Soil survey of Worth County, Iowa, D. S. and A. L. GRAY (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1922, pp. III+271–306, fig. 1, map 1*).—This survey, made in cooperation with the Iowa Experiment Station, deals with the soils of an area of 255,360 acres in north-central Iowa. The county is covered by two glacial depositions. The Iowan drift, occurring in the eastern part of the county, has a smoothly rolling topography interspersed with flat areas. The western half is covered by a drift deposited by the Wisconsin glacier, and the soils devoloped over it are younger and less thoroughly leached than are those of the Iowan drift. The topography of this part varies from flat to rolling.

The soils of the county are derived from glacial drift, consolidated rock formations, and alluvium. Including muck and peat, 26 soil types of 17 series are mapped, of which the Carrington silt loam and loam and the Clarion loam cover 22.8, 21.4, and 14 per cent of the area, respectively.

Soil survey of Jefferson County, Nebraska, L. S. PAINE ET AL. (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1921, pp. III+1443–1485, fig. 1, map 1*).—This survey, made in cooperation with the University of Nebraska, deals with the soils of an area of 369,920 acres lying mostly within the glaciated drift hill area in southeastern Nebraska. The topography of the county is that of a flat to steeply rolling and hilly plain, sloping gradually to the southeast. As a whole the county is well drained.

Including rough broken land, 20 soil types of 11 series are mapped, of which the Grundy and Carrington silt loams cover 37.5 and 21.1 per cent of the area, respectively.

Soil survey of Nance County, Nebraska, F. A. HAYES ET AL. (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1922, pp. III+225–270, fig. 1, map 1*).—This survey, made in cooperation with the University of Nebraska, deals with the soils of an area of 281,600 acres lying in the Plains region in east-central Nebraska. The topography of the uplands ranges from rough and hilly to almost flat, while that of the bottoms and terraces is flat to gently undulating. The county as a whole is well drained.

The soils of the county, with the exception of the recent sand deposits and eroded slopes, have weathered under grass vegetation and under conditions favorable for the accumulation of large quantities of organic matter. The material from which most of the soils have originated is a calcareous light colored silty deposit known as the Plains loess. Including rough broken land and riverwash, 21 soil types of 10 series are mapped, of which the Marshall silt loam coveres 54.9 per cent of the area.

Soil survey of Haywood County, North Carolina, R. C. JURNEY ET AL. (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1922, pp. III+203–224,*

fig. 1, map 1).—This survey, made in cooperation with the North Carolina Department of Agriculture and Experiment Station, deals with the soils of an area of 349,440 acres in western North Carolina. The topography ranges from the rolling valley country to smooth and very rough mountainous slopes. There are some narrow level areas along the streams, the many branches of which extend to all parts of the county. There are no farms without access to one or more drainage outlets.

The soils are prevailingly of loam or clay loam texture and rest on friable subsoils. Rock fragments occur on the surface and in the soil over large areas of the county. Including rough stony land and rock outcrop, 12 soil types of 7 series are mapped, of which rough stony land and Porters stony loam and loam cover 31.4, 31, and 22.5 per cent of the area, respectively.

Soil survey of Lexington County, South Carolina, W. J. LATIMER ET AL. (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1922, pp. III+153–202, fig. 1, map 1*).—This survey deals with the soils of an area of 512,640 acres lying partly in the Piedmont Plateau and partly in the Coastal Plain in west-central South Carolina. The surface ranges from level and undulating to rolling and hilly, and all of the county except strips of bottomland and a few depressions in the uplands is naturally well drained. There are two distinct classes of soils in the county which have different origin, color, and structural characteristics. The northern one-third comprises the so-called clay lands or red clay hills. The southern two-thirds includes a part of the sand-hill belt which comprises extensive areas of sand and light sandy loam soils. Including meadow, 34 soil types of 21 series are mapped, of which the Norfolk sand covers 38.4 per cent of the area.

Soil survey of the Uinta River Valley area, Utah, B. H. HENDRICKSON ET AL. (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1921, pp. IV+1487–1528, pls. 3, figs. 2, map 1*).—This survey, made in cooperation with the Utah Experiment Station, deals with the soils of an area of 190,720 acres lying in the northwestern part of Uintah County in northeastern Utah. The natural drainage is good in the greater part of the area. The arable soils of the area are classified as residual, old valley filling, recent alluvial, and wind-laid soils. All the soils of the area are calcareous. Including rough broken and stony land and dunesand, 31 soil types of 14 series are mapped, of which rough broken and stony land covers 34.7 per cent of the area.

Distribution of nitrogen in the podsol profile, G. EDGINGTON and J. R. ADAMS (*Soil Sci., 20 (1925), No. 2, pp. 177–179*).—In a contribution from the U. S. D. A. Bureau of Soils, data from examinations of a series of soils from Cherry Mountain, N. H., are reported, which indicate that there is a characteristic distribution of nitrogen in this profile, the content being very high in the organic layer and low in the leached layer. The acidity in the different horizons varied little.

Relation of soil alkalinity to its petrographic composition [trans. title], U. PRATOLONGO (*Atti R. Accad. Naz. Lincei, 6. ser., Rend. Cl. Sci. Fis., Mat. e. Nat., 1 (1925), No. 5, pp. 238–243, fig. 1; abs. in Chem. Zentbl., 1925, I, No. 26, p. 2722*).—Studies made to determine the cause of the high alkalinity of some Italian soils having pH values varying from 8.8 to 9 are reported. Special attention was devoted to the possible influence of petrographic composition on reaction. By a process of elimination it was shown that the excessive alkalinity must be due to hydromagnesite or magnesium carbonate.

Hydrogen-ion concentration, soil properties, and growth of higher plants, O. ARRHENIUS (*Arkiv Bot., 18 (1922), No. 1, pp. 54*).—An extensive review of work by the author and others on the subject is presented, dealing with methods of study, the actual acidity of the soil, soil acidity and the con-

ditions accompanying it, pH in relation to biological soil factors, relation of higher plants to soil reaction, reaction of cell sap and the influence of external conditions, and change of soil reaction.

A bibliography is included.

The interaction between silica and electrolytes in its relation to theories of soil acidity, J. N. MUKHERJEE (*Nature [London], 115 (1925), No. 2883, pp. 157, 158*).—It is stated that repeated experiments with hydrated silica purified with the greatest care have shown that this material adsorbs acids, and that anions are preferentially adsorbed. The adsorption of oxalic acid was very easily demonstrated. Further experiments with precipitates like barium sulfate showed a perfect analogy with the reactions observed with silicic acid. In these instances, the possibility of a chemical interaction between an acid and a neutral salt is considered to be very remote.

The carbon dioxide content of the soil air as a factor in the absorption of inorganic elements by plants, F. W. PARKER (*Soil Sci., 20 (1925), No. 1, pp. 39–44*).—Studies conducted at the Alabama Experiment Station are reported, dealing with the influence on the absorption of inorganic elements by plants of the removal of carbon dioxide from the soil air and the addition of this gas to it. In the first experiment, rape, oats, and crimson clover were grown on a poor sandy soil without fertilizer additions other than nitrate. In the second experiment, cowpeas and sorghum were grown in cultures receiving rock phosphate, acid phosphate, and no phosphate.

Neither the removal nor the addition of carbon dioxide materially influenced the yield in either experiment. The phosphorus content of the plant was slightly increased by the addition of carbon dioxide to the soil air under the conditions of the first experiment. The results of the second experiment indicated, however, that the availability of rock phosphate is not influenced by alterations in the carbon dioxide content of the soil air. In most instances the carbon dioxide treatments did not influence the calcium content of the plant, except in the case of cowpeas, in which the addition of carbon dioxide apparently caused a slight increase in the calcium content. In most cases the ash content of the plant was not influenced by the carbon dioxide treatment, the most striking exception being with oats, where the addition of carbon dioxide increased and the removal of carbon dioxide reduced the percentage of ash.

Colloidal behavior of soils and soil fertility.—I, Suction force of soils as an index of their colloid content, J. S. JOFFE and H. C. MCLEAN (*Soil Sci., 20 (1925), No. 2, pp. 169–175, fig. 1*).—Studies conducted at the New Jersey Experiment Stations are reported in which the method of V. G. Kornev[2] for the study of the suction force of the soil is presented and analyzed.

The results indicated that the suction force of the soil, being an expression of the molecular and capillary forces, may be used as an index of the colloid content of the soil. The forces which govern the suction force are therefore to be looked for in the soil colloids, which by virtue of their surface energy possess and exhibit the properties which produce this suction force. Variations in the suction force of like soils with a variable organic matter content seem to indicate the plausibility of using the expression of this force in determining the amount of organic colloids in soils.

The ratio of the suction force of any soil to the suction force of the isolated colloids of the same soil multiplied by 100 may serve as a convenient index of the quantity of colloids present in the soil under the conditions and time of the experiment. There is an indication that the graphic presentation of data

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[2] Zhur. Opytn. Agron. (Russ. Jour. Expt. Landw.), 22 (1921–23), No. 1, Orig., pp. 105–111.

on the suction force of various soil types may serve as a means of establishing not only the quantitative relations of the colloids in the soil, but also many other points in connection with the colloidal behavior of soils.

Heat of wetting of soils dried at different temperatures and the force at which soils absorb water, G. Bouyoucos (*Soil Sci., 20 (1925), No. 1, pp. 67–72*).—Studies conducted at the Michigan Experiment Station to determine the heat of wetting of soils dried at different temperatures are reported.

Drying soils at 50, 75, 107, and 140° C. (122, 167, 224.6, and 284° F.) for 24 hours caused the heat of wetting to increase rapidly up to a temperature of 107°, and to reach its limit at about this temperature. The heat of wetting of soils dried at 107° was from 293.7 to 1,094 per cent greater than that at the temperature of 50°, the heat of wetting at 50° being taken as 100 per cent.

The amount of moisture which is effective in producing the heat of wetting was found to be comparatively small, ranging from 1.4 to 12.1 per cent. Of this total effective moisture only a very small part, driven off at 107°, is responsible for the major portion of the heat of wetting. It was further found that if it were possible to add again to the dry soil only its effective moisture content which is responsible for its heat of wetting, the temperature rise would be enormous.

The force of adsorption was found to range from 92,250 atmospheres in Rhode Island sandy loam to 124,300 atmospheres in Carrington clay loam and 156,200 atmospheres in muck.

It was found that the soils must be dried at around 107° for more than 10 hours in order that they may be dried thoroughly and thereby allow a truer estimation of their colloidal content. The data seem to indicate that a portion of the loss in weight when soils are heated much above 100° represents a loss of organic and inorganic matter by volatilization.

A note on soil shrinkage, E. A. Fisher (*Jour. Agr. Sci. [England], 14 (1924), No. 1, pp. 126–132*).—In a contribution from Leeds University a discussion is given of a recent paper by Haines on soil shrinkage (E. S. R., 54, p. 16), and his explanation of residual shrinkage is criticized in the light of earlier work by the author on the evaporation of water from soil.

A new device for taking maximum and minimum soil temperatures in forest investigations, J. W. Toumey and P. W. Stickel (*Ecology, 6 (1925), No. 2, pp. 171–178, figs. 4*).—In a contribution from Yale University a new device for measuring maximum and minimum soil temperatures in forest soils is described and data from its use are reported.

It was found that in open stations exposed to full sunlight, maximum and minimum thermometers placed with the bulbs resting on the soil in bottomless boxes do not always record the true maximum and minimum temperatures of the undisturbed soil at the same depths, and the nearer the instruments are to the surface the greater is the error. It is considered probable that under the conditions of a forest canopy the divergence between the readings from the soil boxes and from borings in soil wells would be much less and possibly entirely obliterated.

Maximum and minimum thermometers in borings from soil wells appear to give data more closely in accord with actual temperatures at similar depths in undisturbed soil. The mean maxima for April and May, 1924, derived from single weekly readings in the boxes were nearly 3° F. higher and the mean minima 2.5° lower at a depth of 6 in. than corresponding means derived from daily readings. Even at 18 in. the weekly readings gave a mean maximum 1.8° higher and a mean minimum 2.3° lower.

The soil population, S. A. Waksman (*Natl. Acad. Sci. Proc., 11 (1925), No. 8, pp. 476–481*).—In a contribution from the New Jersey Experiment Sta-

tions, a summary of data on the subject is presented, particular reference being made to methods of study of soil organisms.

A study of various strains of Bacillus radicicola from nodules of alfalfa and sweet clover, J. W. STEVENS (*Soil Sci., 20 (1925), No. 1, pp. 45–65, figs. 3*).—Studies conducted at the Wisconsin Experiment Station are reported which showed that strains of the alfalfa-sweet clover group of nodule bacteria differ under similar conditions in their ability to fix free nitrogen and to benefit the host plant.

It was found that the physiological, cultural, and serological characteristics for a given strain do not change in spite of changes in environment and cultivation over a long period of time on different media. The agglutination test was found to separate these organisms into two or more groups which showed little or no serological relation to each other. Organisms of the alfalfa-sweet clover group are not related serologically to a nodule bacteria of the other cross-inoculating groups, and the various strains differ in their resistance to acidity.

Modifying Rhizobium radicicolum, V. BURKE and L. BURKEY (*Soil Sci., 20 (1925), No. 2, pp. 143–147, figs. 2*).—Studies conducted at the Washington State College are briefly reported, the results of which are considered to favor the claim that it is possible to vary the virulence of nitrogen-fixing organisms by subjecting them to a suitable environment. Cultures of *R. radicicolum* may, when left for indefinite periods on media, deteriorate not only because of a loss or reduction in degree of some character but also because the culture may contain two strains, one less desirable which may crowd out the desirable type. The reverse may also occur. Furthermore, an occasional plating out to remove contaminants or determine purity may result in the selection of either strain.

Inoculating soil with Azotobacter, P. L. GAINEY (*Soil Sci., 20 (1925), No. 1, pp. 73–87, figs. 4*).—Studies conducted at the Kansas Experiment Station are reported which showed that a permanent Azotobacter flora could not be established in two Azotobacter-free soils merely by introducing active living organisms. The absence of Azotobacter from these two soils and the failure of introduced Azotobacter to survive is attributed to the acid condition of the soil.

When Azotobacter were introduced into plats to which sufficient basic materials were added to cause and maintain a favorable reaction, namely, an H-ion concentration of less than pH 6, it was possible to establish an Azotobacter flora which, as far as could be determined, was permanent. When Azotobacter were introduced together with insufficient basic materials to maintain a favorable reaction, they were able to survive for only a limited time after the reaction reverted to a condition more acid than pH 6. The establishing of an Azotobacter flora in these soils, normally free from Azotobacter, increased their nitrogen-fixing ability from 2 to 2.5 times.

These results are considered to offer a probable explanation for many of the irregular and inconclusive Azotobacter inoculation experiments reported by others.

Influence of microbes on the resorption of biogenetic elements of soil [trans. title], J. STOKLASA (*Compt. Rend. Acad. Agr. France, 10 (1924), No. 29, pp. 833–845*).—Studies are reported which showed that soil bacteria are especially active in rendering phosphatic, potassic, calcic, and ferric ions available to plants in soil by virtue of their secretions.

Cereals were found to assimilate more phosphatic and potassic ions from a sterile medium, containing no organic matter, than other crops. Inoculation of the medium with bacteria from the root zone of cultivated soils and the

addition of organic matter in the form of peat resulted in an increased assimilability of difficultly soluble nutrients, more especially the phosphates for cereals.

Gramineous plants assimilated anions more readily than the cations, while the reverse was true with root crops such as sugar beets. This is considered to be a fundamental biological characteristic of the roots of different plants.

Partial sterilisation of soil by antiseptics, A. MATTHEWS (*Jour. Agr. Sci. [England], 14 (1924), No. 1, pp. 1–57, figs. 25*).—Studies conducted at the Rothamsted Experimental Station, continuing previous work by Buddin on the subject (E. S. R., 32. p. 816), are reported. These comprised quantitative determinations of the effect on soil protozoa and bacteria of various antiseptic substances, including benzene and its homologues and derivatives, carbon disulfide, ammonia, formaldehyde, and chloropicrin. Ammonia and nitrates were determined at the same time in many cases, and the effect on fungi, eelworm, etc., was also estimated roughly.

Nearly all of these substances were found to disappear from the soil fairly quickly, and at the same time the numbers of bacteria fluctuated. The bacteria were usually reduced in number for the first few days, then rose to a maximum, and finally fell slowly toward normal. The whole fall was sometimes very slow, and the entire process was much slower in field soil than in the richer, lighter, and better aerated greenhouse soils. Aeration had a great influence on the rapidity of the changes.

The increase of the bacteria during the early days of an experiment varied in the same direction as the molecular weights and heats of combustion of the antiseptics, and is attributed to the latter property. Naphthalene, for instance, which has a high heat of combustion, caused enormous rises, while benzene with its lower heat caused smaller rises. This rise was independent of the effect of the substance on the protozoa. Both naphthalene and toluene in large doses caused high rises. The former had no effect on the protozoa, while the latter killed all amoebae and ciliates.

Similar results were obtained when the experiments were conducted on soils already free from protozoa, such as a field soil which had been bottled for 76 years, soil in which the protozoa had been killed by steaming, and soil in which they had been killed by antiseptics. If the protozoa were killed by the use of a strong dose of a suitable antiseptic and the soil then set aside for a long period, a second dose caused an even greater rise than the first.

It is concluded that the rise in the number of the bacteria is due not only to the destruction of the protozoa but largely to the feeding effect of the antiseptic on the bacteria, and that the increased fertility observed by previous investigators is to be attributed in large measure to the activtiy of the greater bacterial population in breaking down the organic matter of the soil. Bacterial rises following treatment with lime or steam were similarly caused in part by the preparation of the plant residues. Aliphatic compounds caused quicker but smaller rises than those of the aromatic series.

The introduction of a CH_3 group into the benzene ring lessened the toxicity to soil organisms, while a single chlorine or nitrogen group increased both the toxicity and the stability in the soil.

Effect of straw on accumulation of nitrates and crop growth, T. L. MARTIN (*Soil Sci., 20 (1925), No. 2, pp. 159–164, figs. 5*).—Studies conducted at Brigham Young University are reported, the results of which indicate that in the Jordan loam soil common to Utah County wheat straw is detrimental to nitrification and to the growth of crops, for a period at least. There is a desirable residual effect, and the principal harm seems to be due to the retarded accumulation of nitrates in the soil.

What is humus? S. A. WAKSMAN (*Natl. Acad. Sci. Proc., 11 (1925), No. 8, pp. 463–468*).—In a contribution from the New Jersey Experiment Stations, the results of studies are briefly reported relating to the nature of the formation of humus in the soil and what agencies contribute to its formation.

It was found that two fractions can be separated from the portion of the soil organic matter soluble in alkali and precipitated by acid. These are (1) the fraction soluble in dilute alkalies and insoluble in dilute acids, and (2) the fraction soluble both in dilute alkalies and in dilute acids and precipitated at a more or less definite isoelectric point, which lies close to pH 4.8. These two fractions were found to be derived in the soil by different processes and probably to exercise different functions in the soil.

The first fraction or so-called humic acid, which gives the black color to the soil, was found to be derived largely from the lignins of the natural organic substances and from the cells of the microorganisms in the soil, and to contain the largest amount of nitrogen. It is the dominant and often the only fraction in soil in which organic matter accumulates in large quantities, as in peat soils and forest mold, and probably accounts for the nonavailability of the large store of the soil nitrogen. The second fraction gives to the soil its buffering properties and accounts to a large extent for the various phenomena usually ascribed to the indefinite organic soil colloids. It combines with the acids and alkalies added to or formed in the soil, preventing them from becoming too injurious to the growth of plants and microorganisms. This fraction is very changeable in quantity, increasing or decreasing according to soil conditions.

The first fraction represents a part of the organic matter which accumulates in the soil as a result of the constant addition of fresh organic materials such as plant roots and stubble, green manures, and stable manure. It can be decomposed, but only very slowly and by a very limited number of soil microorganisms, largely Actinomycetes and a few nonspore-forming bacteria. The origin of the second fraction is still unknown. The fact that peat soils contain largely the first fraction and mineral soils contain also the second fraction, often in even larger amounts, is cosidered to point to the distinct differences in the nature of the organic matter in peat and mineral soils.

Note on the making of artificial farm-yard manure, K. S. V. AYYAR (*Madras Agr. Dept. Yearbook 1923, pp. 21–25*).—Data are briefly reported which showed that the fermentation of a compost of paddy straw and calcium cyanamide was practically complete after 69 days. The resulting material was soft to the touch, brownish black in color, and resembled well-rotted barnyard manure. Chemical analyses showed that there was a loss of 13.65 per cent of the original nitrogen.

Organic manures—availability of plant food, K. ADINARAYANA RAO (*Madras Agr. Dept. Yearbook 1923, pp. 54–60*).—Data on the availability of different organic manures including green-leaf manures and oil cakes are summarized.

Biological investigation of peat, A. ITANO (*Jour. Bact., 10 (1925), No. 1, pp. 87–95, figs. 3*).—Studies conducted at the Massachusetts Experiment Station are reported, which indicated the possibility of rendering peat available as a nitrogen fertilizer when its H-ion concentration has been corrected and certain accessory foods have been added to stimulate the growth and activity of the microorganisms already present.

Conservation and transformation of the nitrogen in stable manure [trans. title], G. SANI and V. GRILLI (*Atti R. Accad. Naz. Lincei, 5. ser., Rend. Cl. Sci. Fis., Mat. e Nat., 33 (1924), II, No. 7–8, pp. 250–253*).—Studies with cow manure and urine are reported which showed that without any treatment the manure lost 32.4 per cent of its original nitrogen content during

storage. Treatments with sulfur alone and with a mixture of sulfur and 14 per cent of acid phosphate were found to favor ammonification and nitrification of the nitrogen compounds of cow manure, but to retard the process of denitrification. Sulfur treatment alone reduced the nitrogen loss to 10.4 per cent while that with a mixture of sulfur and acid phosphate reduced the loss to 4.41 per cent.

Urine treated with acid phosphate retained the most of its nitrogen when used for spraying the manure.

Experiments with drilling liquid manure on oats and on the dissolving action of liquid manure on the mineral constituents of soil [trans. title], E. Blanck and F. Alten (*Jour. Landw., 72 (1924), No. 3, pp. 129–138*).—Experiments conducted at the University of Göttingen are reported which showed that the drilling in of liquid manure on oats gave only small results, which were not so marked as those obtained with sodium nitrate or ammonium sulfate. It was found, however, that liquid manure does have a dissolving action on the mineral constituents of soil.

The fertilizing value of rain and snow, F. T. Shutt (*Canada Expt. Farms, Div. Chem. Rpt., 1924, pp. 8–10*).—The data for the seventeenth year of this investigation begun in 1908 (E. S. R., 52, p. 423) are summarized, together with the figures, permitting a comparison of the annual percipitation and the amounts of nitrogen furnished per acre by the rain and snow during the period of the investigation.

The number of pounds of nitrogen furnished per acre during the year was 11.485, which is 4.568 lbs. above the average for the 17 years. This is attributed largely to the more extensive use of bituminous or semibituminous coal in the city of Ottawa. Owing to this disturbing factor the inquiry is being discontinued. It is concluded, however, from a study of the data of the 17-year period that the amount of nitrogen furnished per acre by the rain and snow in the neighborhood would be approximately 6.5 lbs. annually.

Sour soils and lime materials, H. Dorsey (*Conn. Agr. Col. Ext. Bul. 89 (1925), pp. 16, figs. 4*).—Practical information on acid soils and their correction by liming under Connecticut conditions is presented. Acid phosphate is considered to be a valuable supplement to lime.

Soil acidity and the use of lime on tea soils, P. H. Carpenter, H. R. Cooper, and C. R. Harler (*Indian Tea Assoc., Sci. Dept. Quart. Jour., 1925, No. 1, pp. 1–11, pl. 1*).—Studies are reported which showed that tea grows well only in soils which are definitely acid, and a relatively high degree of acidity apparently favors rapid growth and acts as a stimulant to tea. However, stimulants in excess may prove harmful, and such an excess is reached when very heavy top-dressings of acid peat-jheel are applied to sandy soils deficient in lime. In such cases the effect has always been an enormous increase in crop, which is followed in later years by serious deterioration of the tea due to attack by disease. In such cases lime has often proved useful. Certain root diseases are also encouraged by excessive soil acidity which will not develop in alkaline soil.

Since lime applications increase the permeability of the soil to water and plant roots, it is considered probable that lime may often prove valuable if used in quantities which still leave the soil definitely acid. However, in quantities large enough to reduce the soil acidity greatly, liming will cause a definite loss of crop.

Action of dolerite meal on plant growth [trans. title], E. Blanck and F. Alten (*Jour. Landw., 72 (1924), No. 3, pp. 145–152*).—Experiments conducted for one year at the University of Göttingen led to the tentative conclusion that dolerite meal is ineffective for the production of plant matter.

The manurial properties of lead nitrate, R. A. BERRY (*Jour. Agr. Sci. [England], 14 (1924), No. 1, pp. 58–65, fig. 1*).—Studies conducted at the West of Scotland College of Agriculture, Glasgow, are reported, which showed that lead nitrate as a source of nitrogen for fertilizing purposes is equal to sodium nitrate when applied in quantities equivalent to those employed in agricultural practices. Its effect on the plant was the production of a slightly broader leaf blade and a deeper shade of green as compared with the effect produced by sodium nitrate. No difference in root development was observed.

When used in such amounts no trace of lead could be found in the plant, nor could any lead be detected in a solution made by extracting the treated soil with water. Except in solutions of fairly high concentrations, soil was found to adsorb the lead and destroy the toxicity of soluble lead salts. Evidence was obtained that the addition of lead salts increased the rate of nitrification in soil.

Vegetation experiment with "Asahi Promoloid" [trans. title], E. BLANCK and F. ALTEN (*Jour. Landw., 72 (1924), No. 3, pp. 139–143*).—Experiments conducted at the University of Göttingen on the influence of a water-soluble magnesium preparation containing a large amount of silica on a soy bean crop are briefly reported, showing that the yield was somewhat decreased.

Fertilizer experiments, E. TRUOG, H. J. HARPER, O. C. MAGISTAD, F. W. PARKER, and J. SYKORA (*Wisconsin Sta. Research Bul. 65 (1925), pp. 56, figs. 12*).—The results of a large number of studies on methods of application of fertilizers and on the effect of fertilizers on germination, early growth, hardiness, root growth, lodging, maturity, quality, and yield of crops are summarized.

Commercial fertilizers, agricultural minerals, 1924, F. THOMPSON ET AL. (*Calif. Dept. Agr. Spec. Pub. 52 (1925), pp. 54*).—Guaranties and actual analyses of 352 samples of fertilizers and fertilizer materials and agricultural minerals collected for inspection in California during 1924 are presented and discussed, together with lists of registered fertilizer and agricultural mineral manufacturers and dealers.

Commercial fertilizers (*Md. Univ. Quart. No. 113 (1925), pp. 36*).—Guaranties and actual analyses of 746 samples of fertilizers and fertilizer materials collected for inspection in Maryland from January 1 to August 1, 1925, are reported, together with a summary of the 1924 tonnage records.

Commercial fertilizers, 1924–1925, G. S. FRAPS and S. E. ASBURY (*Texas Sta. Bul. 335 (1925), pp. 3–46*).—This bulletin contains statistics regarding fertilizers sold in Texas, guaranties and actual analyses of 827 samples of fertilizers and fertilizer materials collected for inspection in the State during 1924–25, and registrations.

AGRICULTURAL BOTANY

Manual of cultivated plants, L. H. BAILEY (*New York and London: Macmillan Co., 1924, pp. 851, figs. 14*).—The purpose of this manual is to provide a sufficient and ready means for the identification chiefly of the most commonly cultivated or significant species (not varieties) of plants grown in the open or under glass in the continental United States and Canada for food, ornament, utility, or general interest, including also some of more special interest elsewhere. The international rules of nomenclature are followed. The book is printed from types, not plates, in view of the probability of changes.

Notes on the species hybrids in the genus Mosla, I. NAGAI (*Japan. Jour. Bot., 1 (1923), No. 3, pp. 93–104, pls. 2, figs. 4*).—On account of the production, by certain species of the genus Mosla, of material for the manufacture of thymol, studies have been applied to seven species and one variety, and a number of artificial crossings have been tried. In addition a natural hybrid between *M. grosseserrata* and *M. punctata* has been found. A number of new forms have been isolated. These are regarded as the reassortments of separable characters, not as new species, though they may require new names. The facts noted are discussed.

Succession of epiphytes in the Quercus incana forest at Landour, western Himalayas.—Preliminary note, W. DUDGEON (*Jour. Indian Bot. Soc., 3 (1923), No. 9–10, pp. 270–272*).—The author distinguishes, in this preliminary note, six epiphyte succession stages in the *Q. incana* climatic climax forest. Succession as shown by these epiphytes is unique as regards the short time required for completion, the unusual clearness of the stages, the small size of the plants concerned, and the adaptation of the plants to repeated and prolonged desiccation. It is thought that further study may throw new light on the general problem of succession, more especially in a climate which is strongly periodic.

Contraction and resulting anomalies in roots of Cycas revoluta [trans. title], K. WATANABE (*Japan. Jour. Bot., 2 (1925), No. 4, pp. 293–297, figs. 11*).—Cases of root contraction in monocotyledons and dicotyledons are not uncommon, and cases recorded are referred to. The author notes briefly a case of this kind in *C. revoluta*, with accompanying phenomena. These are to be further studied.

Hibernation and rejuvenation, exemplified by North American herbs, T. HOLM (*Amer. Midland Nat., 9 (1925), Nos. 9, pp. 439–476, figs. 46; 10, pp. 477–512*).—Parts here dealt with somewhat systematically are roots (primary and secondary), hypocotyls, cotyledons, plumules, and buds (in axils of the cotyledons).

A development in agronomic conceptions: The new biochemical theory [trans. title], G. TRUFFAUT (*Jardinage, 11 (1924), Nos. 82, pp. 299–303, fig. 1; 83, pp. 347–353, figs. 6*).—A review of theory and practice regarding soil fertility factors, and plant growth as related thereto and to air, is followed by an exposition of the allegedly essential rôle of microorganisms as regards the fertility of the soil and its maintenance in cropping. Related work has been noted (E. S. R., 40, p. 619; 41, p. 515; 45, p. 29; 47, p. 417; 48, pp. 516, 800; 49, pp. 119, 213; 51, p. 217). Discussion is given of different organisms, their rôles, and their relative importance.

The arrangement and action of material in the plasmatic layers and cell-walls of plants, D. T. MACDOUGAL (*Amer. Phil. Soc. Proc., 63 (1924), No. 1, pp. 76–93, figs. 2*).—The purpose of this paper is to present collated information on the arrangement of colloidal material in the plasmatic layers and walls of the plant cell involved in permeability measurements, and the results of the action of constructed, dead, or living cells in absorption and endosmosis.

The term permeability, as used in this and previous publications, is here defined to denote the condition of the colloidal meshwork of the wall and plasmatic layers, which condition may vary in active cells so that only water and the more mobile ions may pass through when permeability is least and the largest molecular particles when it is greatest.

The composition and arrangement of materials in the plasmatic layer and cell wall are outlined. One of the most important features of the structure described is its incessant variation in composition. In addition to the rapid changes in short-lived absorbing cells or root hairs, the complex membrane is

highly unstable as to its composition. It is obvious that the permeability phenomena observed in such strict and durable membranes as those of collodion and of parchment subtend but a narrow angle in any comprehensive view of the operations which attend the passage of electrolytes, for example, through the enormously complex and continuously variable permeable layers of the cell.

Confirmation of the principal conclusions as to the relative action of similar neutral salts of the common bases has been made. Such action runs generally parallel to the ionic mobilities of the bases and is a straight line function of the charges they carry. Other factors, the effects of which are still being measured, are doubtless to be taken into account.

Results of hydration tests obtained in 1921 show that agar exhibits a greater swelling in dilute solutions of neutral salts than in water. The hydration swelling of gelatin as representative of the ampholytes is such that increase in concentration of acid or of hydroxide is accompanied by increased hydration and permeability within the biological range of concentrations. Any consideration of the action of the cell colloids must proceed upon the accepted fact that hydration and permeability are resultants of the action of the included constituents. The degree of hydration or coefficient of swelling of cell colloids is also the index of permeability, which is invariably a resultant of the reactions of the pentosans and protein gels. The resultant action when a composite mass of the two substances is acted upon by acids or alkalies or by neutral salts will be determined by the proportions of the two present and the relation of the ions in the hydrating liquid to the neutral points, isoelectric zones, or other conditions of the two groups of colloids.

The determination of the zones of concentration in which cells would show maximum or minimum effects was tested with constructed cells as well as with sections of Opuntia. The initial experiments were made with colloidal cells constructed in sets in which one or more of the essential components had been omitted, and the action of complete cells was compared with that of living and of dead cells. An account is given of the distention of living cells of Opuntia in acids, hydroxides, and neutral salt solutions. The extensive data bearing upon these points are presented in tabular form, with discussion.

A series of tests was arranged in which the relation of the concentration of the cell sap in the external solution to the adsorption of the common cations was determined. While the current conceptions of the physical action of the cell make it obvious that the passage of electrolytes into the cell material is affected very little by the osmotic potential of the cell contents, this conclusion has not been directly or adequately tested. The tests here set forth show that the adsorption of chlorides by constructed cells with dilute contents was but slightly different in amount from the adsorption by similar cells with concentrated contents. The relative amounts of the various salts which may be taken up vary with the composition of the cell and other controllable factors. The well-known acceleration of adsorption in solutions made alkaline is strikingly exemplified.

Accretion and distention in plant cells, D. T. MacDougal (*Amer. Nat.*, *59 (1925), No. 663, pp. 336–345*).—Growth (enlargement with differentiation) consists essentially of two reaction groups, synthesis (condensations of proteins and carbohydrates in the accumulation of material in initial elements preceding and following mitosis) and subsequent hydrolysis (with distention). The earlier stage is characterized by the formation of proteins and of lipins. Condensation of sugars progresses. Permeability lessens toward maturity, probably due to the action of absorbed and adsorbed electrolytes. The greatest distention of a cell occurs not precisely in the isoelectric zones of its proteins but

under conditions of electrolytic action in which the complex layer is in a state of least permeability. The actual dry weight of a protoplast does not increase during the distention stage. The earlier changes in volume of the protoplast are due to imbibition and swelling. The later increases result from the osmotic action of substances in solution in syneretic cavities or vacuoles, both being due ultimately to differences in forces referable to vapor pressure. Turgidity is determined by the permeability of the plasmatic layers and walls, especially to the substances in the cell sap, and is the resultant of the combined action not only of the H-ion but of all charged particles or ions which enter into or impinge on the cell on the one hand, and of the activity of the cell sap on the other. Records of growth in trees show no variations indicative of an inherent periodicity in living matter.

Absorption and exudation pressures of sap in plants, D. T. MacDougal (*Amer. Phil. Soc. Proc., 64 (1925), No. 2, pp. 102–130, figs. 6*).—"The present paper presents some studies on nature of negative, adsorption pressures and of bleeding, exudation pressures in plants based upon studies in hydration, water deficit, permeability, and colloidal reactions of cell masses in such succulent plants. Both absorption and exudation phenomena are demonstrated to be due to localized causes. Cell masses abutting on bore holes in stems have been induced to show absorption or exudation pressures at the will of the experimenter. The possibility of the participation of root action or 'root pressures' is not disproven, but on the other hand no positive evidence for such participation has been brought to light in these experiments. Intake of water by empty vessels or tracheids is registered as 'negative' pressures on manometers attached to stumps of stems, or in any manner which connects the instrument with spaces containing gases at less than atmospheric pressure. The capillary intake of water implied is not to be confused with the satisfaction of living cell masses by osmotic absorption or hydration of cell colloids. Both absorption and exudation pressures as measured by a manometer attached to bore holes filled with water in stems are traumatic phenomena. Their measurement, however, yields results of great value in determining osmotic values, water deficit, and permeability of the tissues."

The transport of foods and nutrients in woody plants, O. F. Curtis (*Abs. in Brit. Assoc. Adv. Sci. Rpt., 92 (1924), pp. 443, 444*).—Ringing experiments performed during the growing season showed that materials necessary for growth would not move up through the xylem past the ring. Analyses and cryoscopic determinations indicated that the movement of sugars and other solutes was interfered with by the ring. When, just previous to spring growth, rings were made at different distances from the tip, the growth above the rings was roughly proportional to the amount of food stored above the ring, and quantitative tests indicated that the upward transfer of carbohydrates had been interfered with. Carbohydrates failed to move out of or into the xylem of a given region if this region were isolated, by rings through the phloem, from other tissues which would normally receive or supply these carbohydrates.

The normal upward movement of nitrogen and ash constituents was interfered with when the phloem was cut, though the movement was not completely stopped. This occurred whether the ring was made in the early spring before new xylem and leaves were formed, or in midsummer after growth was practically complete. Evidence was obtained indicating that the influence of the ring on the upward movement of nitrogen was independent of its effect on the organic content of this part above the ring or on transpiration.

Experiments with spiral ringing and other special treatments give further evidence that foods and nutrients travel upwards and downwards chiefly through the phloem.

Plant nutrition.—IV, The nitrogen cycle, M. MOLLIARD (*Nutrition de la Plante. IV, Cycle de l'Azote. Paris: Octave Doin, 1925, pp. XV+319, figs. 56*).—This book, No. 4 of the Catalogue of Physiology of the Encyclopédie Scientifique, deals in its six chapters with protein substances and their derivatives in higher plants, nitrogen nutrition in higher plants, nitrogen nutrition in heterotrophic plants, digestion of protein substances, transformation and rôle of nitrogenous substances, and nitrogenous nonprotein substances.

A bibliography comprises over 200 titles.

The assimilation of iron by plants [trans. title], M. I. SIDORIN (*Nauch. Agron. Zhur.* (*Jour. Landw. Wiss.*), *2* (*1925*), *No. 1, pp. 47–63, fig. 1*).—The author describes experimentation, more recent than that previously noted (E. S. R., 36, p. 633), furnishing to maize plantlets, through separated bundles of their rootlets comprising the root system, iron, to which in these experiments sulfur was added. In case only of young rootlets was partial penetration observed, older plantlets showing normal development of color. Among the necessary elements, sulfur also appeared to act in much the same partial manner as did iron when given separately to some of the rootlets. The behavior of sulfur in this respect appeared to be related to certain anatomical (vascular) peculiarities, also to phases of assimilation of iron and of sulfur, which phases should be taken into consideration in experimentation of this sort.

Manganese in plants [trans. title], A. CUBINI-GALLETTI (*Staz. Sper. Agr. Ital., 57* (*1924*), *No. 4–6, pp. 178–193*).—The author, citing data from researches of others, notably the studies of Jadin and Astruc (E. S. R., 32, p. 628), gives an account of his own work on the presence and apparent relations or influences in certain plants of manganese, aluminum, zinc, iron, copper, and magnesium. The results, as detailed, encourage the author to investigate the possibility of accelerating and intensifying, by means of manganese, enzymic activity in plants.

Influence of saponin on the germination of oily seeds [trans. title], A. CUBINI-GALLETTI (*Staz. Sper. Agr. Ital., 57* (*1924*), *No. 4–6, pp. 147–152*).—Treatment of oily seeds with saponin solutions sensibly quickened germination, due presumably to chemical action on the fats present. No influence of such previous treatment was shown to extend to the later development of the resulting plantlets.

GENETICS

Principles of genetics, E. W. SINNOTT and L. C. DUNN (*New York and London: McGraw-Hill Book Co., 1925, pp. XVIII+431, pl. 1, figs. 140*).—The principles of animal and plant genetics are discussed under the following chapter headings: The science of genetics, heredity and variation, Mendel's laws of inheritance, the expression and interaction of factors, the physical basis of inheritance, linkage, the chromsome theory of inheritance, sex and its inheritance, the inheritance of quantitative characters, types and causes of variation, the application of genetics in plant and animal breeding, inheritance in man, and the problems of eugenics.

Biometrical studies of lint and seed characters in cotton, G. N. STROMAN (*Texas Sta. Bul. 332* (*1925*), *pp. 3–20, figs. 2*).—Statistical studies on 16 Texas varieties of cotton grown in variety trials at the station dealt with the type and variability and interrelations of six important characters.

In mean yield of lint Bennett Lone Star led the varieties and was most variable. Belton made the maximum mean yield of seed and was the most variable variety. Mebane and Bennett Lone Star were close seconds in lint yield and seed yield, respectively. The varieties ranged from Star with 42.84 per cent of lint and Kasch with 42.67 per cent down to Snowflake with 29.67 per cent. Snowflake with 1$\frac{5}{16}$ in. was outstanding in mean length of lint, although it was more variable than most other varieties. Bennett Lone Star and Watson led in number of 5-lock bolls and Snowflake in 4-lock bolls. The Star variety had the heaviest 5- and 4-lock bolls, and the 5-lock bolls outweighed the 4-lock bolls in practically all cases. Average ranges of 72.9 days to 77.3 days to first bloom and of 111.8 days to 115.8 days to first open boll were observed in the 16 varieties, showing that earliness might be developed through selection for this character.

All varieties showed positive correlations between yield of lint and seed yield, number of 5-lock bolls, and number of 4-lock bolls; and between seed yield and number of 5-lock bolls, and number of 4-lock bolls. No consistent relations were shown in the case of different varieties between lint yield and lint percentage or lint length; between seed yield and lint percentage or lint length; lint percentage and lint length; nor between the percentage or length of lint with either 5-lock or 4-lock bolls.

Heritable chlorophyll deficiencies in seedling cotton, G. N. Stroman and C. H. Mahoney (*Texas Sta. Bul. 333 (1925), pp. 3–22, figs. 3*).—Two factor pairs, Y_1y_1 and Y_2y_2 appeared to be involved in the production of the seedling character in cotton, yellow seed leaves instead of the usual green. The expression of "pattern," another chlorophyll deficient seedling which ranges from a seedling with distinct areas devoid of chlorophyll to one which has a small amount of chlorophyll throughout the leaf, is shown to be due to two (C_1, C_2) and possibly three (C_3) different genetic factors. It is possible that two of these factors are linked. The amount of cross-fertilization in cotton in the field at the station in 1924 was estimated to be 2.46 per cent.

Genetic studies in Lycopersicum.—I, The heredity of fruit shape in the garden tomato, P. A. Warren (*Mich. Acad. Sci., Arts, and Letters, Papers, 4 (1924), pt. 1, pp. 357–394*).—As a result of a genetical analysis of data taken on the fruits of seedlings produced from known crosses between 10 selected varieties of garden tomatoes, representing 8 distinct types of fruit, the author suggests genotypic formulae for the several varieties in respect to the factors for depth and fasciation of fruit, deemed to be the determiners of fruit type. A summation of all segregations for depth and for fasciation gave a 9.23 : 6.77 ratio for depth in 603 individuals and a 9.3 : 6.7 ratio for 854 individuals, leading to the suggestion of a complementary factor hypothesis for both characters according to the Mendelian 9 : 7 ratio.

Inheritance of color patterns in the grouse locust, Telmatettix aztecus saussure, R. K. Nabours and B. Snyder (*Abs. in Anat. Rec., 29 (1924), No. 2 p. 152*).—Studies of the hereditary behavior of the pattern of the grouse locust, *T. aztecus saussure*, in specimens secured from Austin, Tex., and Los Angeles, Calif., have indicated the operation of the following factors: + for a mottled gray over the entire body which is recessive to all other factors; *C*, dull white on anterior pronotum; *Bl*, black on anterior pronotum; *H*, green gray nearly all over; and *R*, dull brick red nearly all over. Only 62 of 115 matings made were productive, and 1,938 offspring were recorded. The heterozygote pattern produced by any of the two factors except + is intermediate. Studies of parthenogenetic development indicated that factor segregation occurs as in bisexual reproduction.

Modifications and mutations in rabbit coloring [trans. title], W. Schultz (*Arch. Mikros. Anat. u. Entwickl. Mech., 104 (1925), No. 1–2, pp. 88–108*).—The

production by cold of black hair on certain parts of the body of rabbits which were previously white or yellow (E. S. R., 53, p. 526) has been continued with other types, and the results of the new findings are discussed with special reference to the effect of the latent factors carried by such individuals.

It was found that the latent factors could in many cases be developed in the soma by the action of various external influences. New genes were suggested for the determination of pure yellow, Thuringen yellow with different dark patterns, and a series of multiple allelomorphs for Japanese black spotting. The effect of age in certain cases and in other animals is also noted, and hypothetically explained as due to a reduced amount of water and poorer nutrition which modify the colloidal condition of the skin and hair roots. The rate of darkening of the coat has been found to differ in animals heterozygous and homozygous for dominant characters, all of which tends to indicate the possible action of recessive factors.

Studies of the cause of partial albinism in the Himalayan rabbit [trans. title], L. KAUFMAN (*Pam. Państ. Inst. Nauk. Gosp. Wiejsk. Pulawach* (*Mém Inst. Natl. Polon. Écon. Rurale Pulawy*), *4* (*1923*), *A*, *pp. 199–217*, *figs. 2*; *Eng. trans. in Biol. Gen.*, *1* (*1925*), *No. 1*, *pp. 7–21*, *figs. 2*).—The author has repeated the experiments of Schultz with Himalayan rabbits (E. S. R., 49, p. 165), and has found that when the white hair was plucked the new developing hairs were black if the temperature was below 6° C. (42.8° F.), but that when below 11° the new developing hairs were white. This demonstrates the presence of the ability of all the hair to produce color under the proper conditions. In studying the cause of this peculiarity extracts of the skin of newborn rabbits were found to be unable to darken a solution of tyrosine but such extracts from pigmented skin or solutions of H_2O_2 injected into the skin caused the formation of pigment under favorable conditions. The results demonstrated a lack of tyrosine in the skin of these rabbits. Alkalinization caused the darkening of the skin. No ferment seemed to be involved.

Inflammation in one ear of one Himalayan rabbit causing a local rising temperature resulted in a change from black to white in the new developing fur. The author believes that the color change accompanying the change in temperature is due to an alteration of the H-ion concentration.

The inheritance of abnormal appendages among the descendants of X-rayed mice, C. C. LITTLE (*Abs. in Anat. Rec.*, *29* (*1924*), *No. 2*, *p. 151*).—An explanation of the inheritance of the abnormality of feet and legs previously noted among the descendants of X-rayed mice at the University of Maine (E. S. R., 52, p. 131) is described. A factor *F* produces normal feet and legs, while its recessive causes the abnormal condition. A gene M^n modifies *ff* in the direction of normal. M^a modifies *ff* in the direction of abnormal. M^nM^nff animals are usually normal, rarely abnormal. M^nM^aff animals are usually abnormal and M^aM^aff animals die, due to a lethal action of M^aM^a. The hereditary relation of the eye abnormality *hh* to the foot abnormality suggests that the two variations are at least partially independent.

Heredity of a character acquired by grafting in Jerusalem artichoke [trans. title], L. DANIEL (*Compt. Rend. Acad. Sci.* [*Paris*], *177* (*1923*), *No. 26*, *pp. 1449–1452*, *figs. 2*).—Supplementing previous investigations (E. S. R., 47, p. 339), the author, in 1921, grafted Jerusalem artichoke on annual sunflowers and obtained numerous aerial tubers, in some cases coincident with seed production. Plants produced by these seeds in 1922 varied as regards vigor, precocity, leaf form, inflorescence, and tuberization. Six of the most widely differing tubers were planted in 1923, and all perpetuated their distinguishing characters. It appeared, however, that heredity of tuberization proceeds irregularly and with variable intensity.

Hereditary deaf-mutism.—A study of the Mendelian factors in the inheritance of deaf-mutism, J. J. KRAATZ (*Jour. Heredity, 16 (1925), No. 7, pp. 265–270, figs. 3*).—A study of the offspring in marriages of deaf and normal individuals indicated that deafness could not be due to a single dominant, a single recessive, or to two dominant factors, nor was it sex linked. Most of the data fitted an hypothesis in which hereditary deafness was due to either or both of two independent recessive characters.

Mendelian analysis of the pure breeds of livestock.—III, The Shorthorns, H. C. MCPHEE and S. WRIGHT (*Jour. Heredity, 16 (1925), No. 6, pp. 205–215, figs. 4*).—In continuing this series of studies (E. S. R., 51, p. 525), coefficients of inbreeding and relationship have been calculated from random samples of portions of the pedigrees of bulls and cows selected at random from the different volumes of the Shorthorn herdbooks. Both the coefficients of inbreeding and relationship showed that considerable increases in the homogeneity of the breed occurred about 1850. The diffusion through the breed of the blood of the bull Champion of England between 1875 and 1900 tended to bring down the inbreeding coefficient slightly, but the degree of relationship within the breed has remained practically constant since 1850. The relationship between the bull Favourite and the breed has increased with some irregularity from 44 in 1810 to 55 per cent in 1920, while the relationship of Champion of England was increased from 26 to 46 per cent in the corresponding years. The breed is considered to be in equilibrium as far as its inbreeding is concerned, showing 26 per cent in 1920.

The improvement of the Smooth Cayenne pineapple variety through bud selection, A. D. SHAMEL (*Hawaii Univ., Ann. Short Course Pineapple Prod., 3 (1924), pp. 69–85*).—Preliminary observations in pineapple fields having indicated the existence of a considerable percentage (25) of nonproductive plants characterized by the author as regressive variations, a plan of selective improvement is outlined with a view to the propagating of only the highest quality types.

Natural crossing in oats, F. GRIFFEE and H. K. HAYES (*Jour. Amer. Soc. Agron., 17 (1925), No. 9, pp. 545–549*).—To study the amount of natural crossing at the Minnesota Experiment Station, black-grained varieties of oats were grown in alternate rows with white-grained varieties.

The natural crossing observed varied with the variety of oats. The number of aberrant types resulting from natural crosses ranged from 0.04 per cent in Victory to 1.4 per cent in Kanota. The actual amount of natural crossing is at least twice as great as indicated by the off-types observed. Except in Kanota, the frequency of natural crossing in oats at the station was less than was observed previously with wheat.

A comparison of the heterozygotes from reciprocal crosses in the bar series of Drosophila melanogaster, A. H. HERSH (*Abs. in Anat. Rec., 29 (1924), No. 2, pp. 145, 146*).—The production of reciprocal crosses in the bar series of triple allelomorphs at 7 different temperatures varying from 15 to 32° C. (59 to 89.6° F.) has indicated that the heterozygotes resulting differ significantly in their facet number in two of the three possible cases. This results from the fact that the rate of decrease per degree increase in temperature differs for the heterozygotes from reciprocal crosses. The decrease in facet number was about 10 per cent per degree increase in temperature in the offspring of matings of homozygous bar parents and in the heterozygotes from bar ♀ × ultra-bar ♂, and from full ♀ × ultra-bar ♂ parents. The offspring of homozygous ultra-bar parents, ultra-bar ♀ × bar ♂, and ultra-bar ♀ × full ♂ parents showed a decrease of about 8 per cent. The degree of dominance for these differences varies not only with the temperature, but also

with the direction in which the cross is made. The differential factors are suggested as occurring in the organization of the egg.

A self-fertile strain of Drosophila which is partially sterile in outcrosses, H. H. PLOUGH (*Abs. in Anat. Rec., 29 (1924), No. 2, pp. 149, 150*).—In experiments at Amherst College, strains of Drosophila have been produced which were self-fertile, but which were found to be infertile in crosses. One of these strains probably carries genetic factors which make it infertile in outcrosses having practically the same derivation in spite of a fair degree of self-fertility.

Has parthenogenesis been confused with hermaphroditism in the Cucurbita? G. B. DURHAM (*Ztschr. Induktive Abstam. u. Vererbungslehre, 37 (1925), No. 4, pp. 358–361*).—In reporting further (E. S. R., 48, p. 535) upon squash breeding investigations at the Connecticut Agricultural College, the author reports that attempts in 1922 to induce parthenocarpic and parthenogenetic responses by artificial stimulation of the style and stigma were fruitless. In 1924, 1 of 301 protected blossoms showed signs of parthenocarpic development. That hermaphroditism in Cucurbita is affected to a certain degree by environmental conditions was indicated in observations upon a population of 509 plants, which at midseason contained 90 plants possessing some hermaphroditic blooms. Following a drought and subsequent heavy rains, 75 of these abnormal plants returned to a normal condition of monoecism, 4 were partially hermaphroditic with normal fruits, 1 was totally hermaphroditic with 3 fruits, while the remainder were totally hermaphroditic with no fruits. These conditions remained unchanged until the end of the season.

Observations of several years upon hermaphroditic fruits indicated that short-stemmed specimens develop further than do longer hollow-stemmed fruits. All hermaphroditic fruits possessed navels. Of 560 seeds of hermaphroditic origin, 94 were abnormal in shape. A microscopic examination of pollen of hermaphroditic blooms showed two distinct types, a normal and a smaller solid abnormal grain. The proportion of abnormal to normal grains conformed closely to the proportion of abnormal to normal seeds.

An introduction to sexual physiology for biological, medical, and agricultural students, F. H. A. MARSHALL (*London and New York: Longmans, Green & Co., 1925, pp. XII+167, figs. 74*).—This book deals with the physiological processes related to sex and reproduction in the higher animals and man. The following chapters are included: The reproductive organs in the higher animals; the mammalian sexual cycle; pregnancy; parturition, puerperium, lactation; the internal secretions of the organs of reproduction; heredity and sex; and fertility.

Dynamics of ovarian hypertrophy under experimental conditions, A. LIPSCHÜTZ (*Brit. Jour. Expt. Biol., 2 (1925), No. 3, pp. 331–346, pls. 2*).—In studying the hypertrophy of ovarian fragments, one ovary and from one-half to three-fourths of the other ovary were removed from rabbits. The remaining ovarian fragments were removed after approximately 5 to 16 months for histological study. The results showed that the fragments usually attained approximately the size of one normal ovary, but the numbers of young ova contained were reduced. The hypertrophy was found to be due to follicular development, with a tendency toward cystic degeneration. The uteri were normal in three out of six cases in which the hypertrophied ovarian fragments were present.

In one experiment, 15 ovaries from young rabbits were ingrafted subcutaneously into five females which were mostly litter mates of the individuals from which the ovaries were procured. The grafts all disappeared within 2 months,

indicating that ovarian grafts are difficult in females containing normal ovaries.

The influence of certain factors on the weight of the newborn of mammals [trans. title], S. Kopeć (*Pam. Państ. Inst. Nauk. Gosp. Wiejsk. Pulawach (Mém. Inst. Natl. Polon. Econ. Rurale Pulawy), 4 (1923), A, pp. 173–198*).—The author has made a statistical study of the effect of size of litter, nutrition and age of dam, and duration of gestation on the birth weights and size of litters of rabbits. Himalayan and silvered rabbits and the F_1 and F_2 crossbreds were used mostly for the investigation, each type being tabulated separately. The results showed that the birth weights in the different races were proportional to the mature weights for the race. Litter size was found to influence the birth weight markedly, correlations of -0.710 ± 0.059 or greater being calculated between litter size and birth weight except in the F_1s made by reciprocal crosses, in which the correlations were -0.516 ± 0.074 and -0.522 ± 0.100.

The size of the litters had no influence on the variability of the birth weights. The age of the dams did not influence the size of litters or birth weights of litters produced during the first two years, but dams three years old produced larger litters and heavier young. The change in weight of the dam during gestation as indicated by the differences between weight at copulation and the dam's weight just before and just after parturition had a direct influence on the birth weights of the young, the correlations being greater than 0.413 ± 0.093 in five of the six correlations determined. The comparative weights of the dams for different litters at copulation and after parturition did not have any apparent influence on the average weights of the young.

The metabolism of the dam during gestation had a direct influence on the dam's weight, the influence being greater after parturition than at the beginning of gestation. The length of the gestation period and size of litter showed a correlation of -0.586 ± 0.073 for one lot of rabbits and -0.421 ± 0.124 for another lot. The average weight of the young was directly related to the gestation period. The average weights of individuals having the same gestation periods were greater in smaller litters.

On the inheritance of weight in rabbits from a study of the newborn [trans. title], S. Kopeć (*Pam. Państ. Inst. Nauk. Gosp. Wiejsk. Pulawach (Mém. Inst. Natl. Polon. Écon. Rurale Pulawy), 4 (1923), A, pp. 218–243*).—The birth weights have been determined for the offspring of 7 Himalayan does mated with 1 Himalayan buck and 4 silvered does mated to 1 silvered buck and the crossbred offspring produced by one of the daughters of each of the above does mated with the other type, as well as the F_2 offspring produced by 7 daughters of one of the F_1 females mated to her brother.

Since the birth weights were shown in the above paper to be influenced by the size of litter, only litters including 4 to 6 individuals are included in the tabulations, and all were produced by females when from 1 to 2 years of age. The average birth weights of the Himalayan rabbits were 35.92 ± 0.33 gm. and of the silver rabbits 44.19 ± 0.34 gm. The F_1s of the cross silver ♂ × Himalayan ♀ averaged 41.91 ± 0.37 gm., as compared with 43.30 ± 0.39 gm. for the F_1s of the reciprocal cross. The weights of the F_2 generation were similar to the F_1s except that the variability was much greater. The F_2 individuals showed a diminished variability. The offspring of certain individuals showed differences as compared with the whole population, but in general the inheritance of birth weight seemed to be controlled by multiple factors apparently independent of color.

Chromosome breakage by X-rays and the production of eggs from genetically male tissue in Drosophila, H. J. Muller (*Abs. in Anat. Rec., 29 (1924), No. 2, p. 150*).—The results of experiments at the University of

Texas have indicated that comparatively light doses of X-rays caused the breakage of the double X chromosome in the stocks of Drosophila described by Morgan (E. S. R., 48, p. 165) in about 2 per cent of the eggs exposed. The susceptible stage is less than 6 days before the eggs are laid. Breakage occurs probably near the bend of the V. The natural breakage occurred much less frequently in controls and more often in the oogonia than at maturation. The natural break was usually asymmetrical and yielded inviable zygotes when combined with a normal X. Since the chromosome fragment lacking spindle attachment could not progress, oogonia were formed containing only one X chromosome and a Y chromosome with sex genes characteristic of spermatogonia which nevertheless undergo oogenesis. In one case the male composition must have been acquired several cell generations before the primary oocytes, and any female substances originally present would have been diluted many times before egg formation commenced.

The effect of X-rays on rats, L. H. SNYDER (*Abs. in Anat. Rec., 29 (1924), No. 2, p. 151*).—In experiments previously noted (E. S. R., 53, p. 430), a dosage of X-ray was found for the testicles which resulted in normal fertility for 2 months following the treatment, followed by from 2 to 6 months of sterility, after which complete fertility was again restored. Several hundred individuals have been obtained, reaching to the fourth generation and originating from the first litter after sterility, all of which were normal and fertile.

FIELD CROPS

The organization and conclusion of field experiments [trans. title], R. K. KRISTENSEN (*Tidsskr. Planteavl, 31 (1925), No. 3, pp. 464–494*).—The arrangement of plats and other phases of organization of field experiments are discussed, and different methods of calculating the results, with special reference to the elimination of the probable error, are presented. The work along this line of different investigators is briefly reviewed, and the different methods of calculation, together with the formulas employed, are explained in detail.

Modern methods of breeding forage plants [trans. title], ZADE (*Mitt. Deut. Landw. Gesell., 40 (1925), No. 16, pp. 296–301, figs. 4*).—Controlled pollination in grasses, clovers, and alfalfa is discussed with regard to improved technique. Illustrations of an isolation cage for clover and of schemes for depicting root systems of clovers and grasses are included, with tabulated physical and chemical analyses of several grasses, clovers, and alfalfa.

Making photographs of plants to be used as illustrations for scientific papers, M. W. EVANS (*Jour. Amer. Soc. Agron., 17 (1925), No. 9, pp. 526–532, figs. 5*).—The proper use of backgrounds and arrangement of material are described and illustrated.

[The Woburn field experiments, 1923 and 1924], J. A. VOELCKER (*Rothamsted Expt. Sta., Harpenden, Rpt. 1923–1924, pp. 77–89*).—Further investigations with field crops (E. S. R., 50, p. 637) were carried on under adverse seasonal conditions which were responsible for reduced yields.

In the continuous wheat experiment the highest grain yields in 1923 were 13 bu. with 1,260 lbs. of straw from the plat receiving minerals with sodium nitrate, and in 1924 18 bu. with 3,528 lbs. of straw from the plat receiving potassium sulfate and sodium nitrate. The respective averages for 1923 and 1924 were from the untreated checks 5.6 and 1.6 bu., rape dust 8.8 and 9.5 bu., barnyard manure 11.7 and 17.5 bu., and mineral fertilizers 8.9 and 3.5 bu.

Poor crops were also obtained in the continuous barley trials. The plat receiving barnyard manure continued to lead in 1923 with 21.8 bu. and 2,016 lbs. of straw, but in 1924 it was tied with the plat receiving minerals and

sodium nitrate, each producing 13 bu. and in excess of 1,020 lbs. of straw. Untreated plats averaged 3.9 bu. in 1923 and 1.7 in 1924, rape dust giving only slightly more grain.

Fertilizer trials with malting barley and rotation, green manuring, and liming experiments are reported on briefly. Ammonium chloride seemed to give larger yields of wheat and barley than ammonium sulfate, while the reverse held for mangels and swedes.

[Field crops experiments in Aberdeen, Scotland] (*North of Scot. Col. Agr., Guide Expts. [etc.] Craibstone, 1925, pp. 9–33*).—Investigations with various cereal, forage, and root crops carried on at Craibstone farm near Aberdeen are reported for 1924 in continuation of earlier work (E. S. R., 52, p. 227).

[Field crops experiments in South Australia, 1921–22, 1922–23, and 1923–24], A. J. Perkins and W. J. Spafford (*So. Aust. Min. Agr. Rpt. 1922, pp. 13–15, 30–35; 1923, pp. 11–13, 17–23; 1924, pp. 11, 12, 67–73*).—These pages report the continuation of earlier investigations (E. S. R., 48, p. 630).

Cultural systems and rotations [trans. title], L. P. Roy (*Min. Agr. Prov. Québec Bul. 91 (1925), pp. 74, pls. 2, figs. 28*).—A practical discussion of cultural systems and crop rotations considered suitable for farms in Quebec.

Electro-culture investigations (*Jour. Min. Agr. [Gt. Brit.], 32 (1925), No. 6, pp. 561–563*).—Electrocultural investigations (E. S. R., 51, pp. 231, 232) with cereals were continued at Rothamsted and Lincluden during 1924.

Pot culture tests with Goldthorpe barley at Rothamsted, wherein plants were subjected to current of different strengths and duration, resulted in increased grain yields, not exceeding 21 per cent, over the controls. Previous experience was confirmed that with both barley and oats electrification for 1 month was as effective as 3 months. In the electrified plants the increase in grain yield is relatively higher than that of total yield (straw plus grain). A relative decrease in total yield may even be associated with an increase in grain yield. On the oats plats at Lincluden treatment during the first month was more effective than during the second or third months. Removal of plants from the influence of normal atmospheric currents produced a rather insignificant increase.

Crops for new land on irrigation projects in Washington, H. P. Singleton (*Washington Col. Sta. Pop. Bul. 132 (1925), pp. 3–22, figs. 8*).—Cultural practices and irrigation methods are outlined, and for certain crops varieties are indicated, for the production of alfalfa, sweet clover, wheat, barley, oats, rye, corn, potatoes, root crops, and vegetables on new lands on irrigation projects.

Experiments with Danish and foreign strains of clovers and grasses, IV: 1918–1924 [trans. title], E. Lindhard (*Tidsskr. Planteavl, 31 (1925), No. 2, pp. 169–245*).—The results of tests with strains of clover and grasses from different sources conducted in various localities for a period of years and previously noted (E. S. R., 40, p. 232) are discussed at some length. The crops under test comprise early and late red clover, orchard grass, English rye grass, Italian rye grass, and kidney vetch. The varieties giving the highest average yields were Tystofte No. 40 early red clover, Tystofte No. 7 late red clover, Tystofte No. 8 medium early kidney vetch, Lyngby strain of orchard grass, a Scotch strain of English rye grass, and Tystofte No. 152 Italian rye grass.

The leguminous crops (*Rothamsted Expt. Sta., Harpenden, Rpt. 1923–1924, pp. 24–26, 114, 115, 129*).—Among fertilizers applied to barley, ammonium sulfate did not appear to affect adversely clover sown in the barley, although it increased the barley yield. Phosphate seemed without influence, while potassium exerted a distinct residual effect.

The failure of inoculation has been traced to the presence of the organisms in the soil, dead cultures, and excessive acidity. Seed inoculation of alfalfa and its relation to the motility of the nodule organism in the soil has been reported on (E. S. R., 53, p. 232).

In pot experiments, unrotted straw greatly increased the number of nodules formed on each clover plant, although yield did not increase until phosphates were added. Field tests showed a dressing of straw and phosphate to be an effective fertilizer for beans and to afford a possibly practical means of increasing the soil organic matter.

W. E. Brenchley and H. G. Thornton showed boron to be essential to the proper functioning of nodules on the roots of the broad bean. Normally, conducting vessels grow out from the vascular system of the plant root and enter the nodule. Along these vessels food materials pass from the plant to the bacteria and the products of their activity return to the plant. In the absence of boron these vessels do not form or are very slightly developed. Losing their normal sources of food the organisms become parasitic and destroy the plant protoplasm. The successful growth of a legume crop appears to depend on the presence of the proper organisms and soil conditions necessary for their growth, proper plant nutrition, and the development of the conducting system linking the organisms in the nodule with the circulating system of the plant.

The effect of light and heavy dressings of lime on grassland, W. E. Brenchley (*Jour. Min. Agr. [Gt. Brit.], 32 (1925), No. 6, pp. 504–512*).—Experiments at Rothamsted were concerned with the improvement of grassland as regards yield and quality of herbage. With manure only, lime in heavy or light applications caused reduced yields in both first and second crops, the composition of the herbage not being changed markedly except that sweet vernal grass and tall oat grass were reduced in quantity. With manure and commercial fertilizers a light application of lime caused a substantial increase in the first cutting of hay, which more than offset a decrease in the aftermath, and the character of the herbage was greatly improved. Heavy liming did not affect the yields to such an extent, and, although little improvement in growth appeared, bent grass and tall oat grass were considerably reduced and downy oat grass (*Avena pubescens*) and meadow foxtail increased in the herbage. Application of commercial fertilizer without phosphate did not affect the total yields much, but growth was earlier with both light and heavy liming, resulting in an increased first crop and a decreased second crop. Liming caused some improvement in the herbage by reducing bent grass and increasing foxtail and tall oat grass. A heavy monetary loss was sustained where lime was used in conjunction with manure alone, but a moderate profit was had when a light dressing of lime was given with manure and commercial fertilizers.

A bibliographic study of Beauvois' Agrostographie, C. D. Niles (*U. S. Natl. Mus., Contrib. U. S. Natl. Herbarium, 24 (1925), pt. 6, pp. 135–214+XIX*).—The results of an exhaustive study of the 256-page book on grasses published by Palisot de Beauvois in 1812, under the title Essai d'une Nouvelle Agrostographie, are presented, together with botanical notes and introduction by A. Chase.

Root crop experiments at Östergötland [trans. title], I. Wålstedt (*Sveriges Utsädesför. Tidskr., 35 (1925), No. 2, pp. 59–75, fig. 1*).—The results of trials with varieties of swedes, field beets, and sugar beets, conducted for a series of years, are reviewed, and the average yields are given in tabular form.

The swedes produced the largest yields, the leading variety being Bangholm. Among the field beet varieties which stood next to the swedes in yield, the

variety Barres gave the most satisfactory returns. The turnips, with the Bortfelder variety as the leader, seemed to be best on moor soils and on some of the higher sandy and loam soils. Two strains of Svalöf sugar beets compared favorably in yield of beets and in sugar production with the Kleinwanzleben variety.

Corn and soybeans as a combination crop for silage, W. L. SLATE, JR., and B. A. BROWN (*Connecticut Storrs Sta. Bul. 133 (1925), pp. 353–376, pls. 3*).—In experiments during 4 years with corn and soy beans for silage, the combination averaged about 1 ton of green forage and 500 lbs. of dry matter per acre more than corn alone. Considering only the best varieties of soy beans the gain over corn alone averaged over 1.5 tons of green weight and 757 lbs of dry matter. Soy beans grown alone did not yield half as much as corn. As harvested corn and soy bean silage averaged 1.82 per cent protein (670 lbs. per acre), while corn silage averaged 1.54 per cent protein (550 lbs.). Soy beans narrowed the nutritive ratio from 1:13 to 1:9.8. The association with soy beans did not increase the nitrogen (protein) content of the corn.

One stalk of corn to three of beans per foot of row has given the largest total yields of green and dry matter and protein. Drilling the corn and soy beans proved decidedly better than planting both in the same hill or the beans between the corn hills. For growing with corn there is required a stiff stemmed, reasonably tall, large yielding soy bean variety, which will have its pods two-thirds filled when the corn is ready to cut. Medium Green (Guelph), Hollybrook (Midwest), Swan, Wilson, or similar varieties are suggested for Connecticut.

Although the experimental results indicate that planting soy beans with the corn increases the acre value of the silage by about $10, this does not warrant much increase in the cost of planting, cultivating, and harvesting. The combination does not seem practical unless planted at the same operation as corn alone, on land not weedy enough to need hand hoeing when cultivated only one way, and where a binder can be used for harvesting.

The influence of fertilizers in protecting corn against freezing, O. C. MAGISTAD and E. TRUOG (*Jour. Amer. Soc. Agron., 17 (1925), No. 9, pp. 517–526, fig. 1*).—According to experimental results obtained on three soil types at the Wisconsin Experiment Station, application of fertilizers in the hill increases the osmotic pressure of the sap of young corn plants, which in turn lowers the freezing temperature of the plant from 1 to 2° C. This is often enough to prevent plants from being frozen by late spring frosts not too severe. When the temperature drops slightly below freezing further decrease is retarded, due to the heat produced by the freezing of free water and easily frozen plant material. Usually enough heat is liberated to prevent the temperature from falling more than 1 to 2° below the freezing point. Under these conditions properly fertilized corn plants are not frozen.

Experiments in seeding flax on different dates and at different rates [trans. title], H. WITTE (*Svenska Mosskulturför., 39 (1925), No. 4, pp. 229–240*).—The results of experiments conducted from 1917 to 1924 indicated that seeding about May 20 was preferable to seeding later, and that the use of 120 to 130 kg. of seed per hectare (107 to 116 lbs. per acre) seemed most satisfactory under the conditions which prevailed. The average yields per hectare were approximately 4,500 kg. of straw (4,005 lbs. per acre) and from 600 to 650 kg. of seed. It was observed that early-sown as compared with later-sown flax is somewhat longer in coming up and in developing, and that in general the flax crop requires a little over 100 days to reach maturity.

Influence of method of seeding on the yield and quality of the horse bean [trans. title], O. WÖRMANN (*Pflanzenbau [Berlin], Nos. 20 (1925), pp. 329–337; 21, pp. 349–358*).—In experiments carried on in three localities in Germany during two years, Eckendorf horse beans (*Vicia faba minor*) were planted about March 20 and April 7 and 21 at rates of 30, 60, and 75 kg. per morgen (104.6, 209.2, and 261.5 lbs. per acre, respectively), in 15-, 30-, and 45-cm. drill widths and at 4-, 6-, and 9-cm. depths.

The earliest seedings produced the highest yields and best quality of beans, although germination was weaker. A heavy rate, 60–75 kg. per morgen, gave the best yields and germination and the most dry matter, while the protein content was higher in the produce from the lightest seeding. An average (30 cm.) drill width seemed preferable. Beans grown in the 45-cm. drill yielded less and had a lower protein content as compared with those grown in the closer rows. Beans sown shallow (4 cm.) made poor stands, produced lower yields and less dry matter, had a lower protein content, and were less resistant to lodging. The 6- and 9-cm. depths were similar in their results, except that the 6-cm. depth produced a higher protein content. The 9-cm. depth seemed best for varieties susceptible to lodging and 6 cm. for resistant sorts.

The relation of coleoptile length to yield in oats, N. A. PETTINGER (*Jour. Amer. Soc. Agron., 17 (1925), No. 9, pp. 537–544, figs. 3*).—A study of the relation between coleoptile length and yield from the seed of 206 individual plant selections of Early Champion oats was made at the Illinois Experiment Station, the rag doll method of germination being used in conjunction with head row plat trials.

Correlation coefficients obtained are as follows: Between uncorrected coleoptile length and uncorrected yield, 0.37 ± 0.04; between corrected coleoptile length and uncorrected yield, 0.29 ± 0.04; between uncorrected coleoptile length and corrected yield, 0.28 ± 0.04; and between corrected coleoptile length and corrected yield, 0.38 ± 0.04. While these coefficients are mathematically significant, they are not considered to be biologically significant, the author concluding that coleoptile length is not a reliable index of yield.

Potatoes (*Rothamsted Expt. Sta., Harpenden, Rpt. 1923–1924, pp. 21, 22, 120, 121*).—Application of potassium sulfate and of potassium chloride to potatoes gave similar results as regards yields, in experiments at Rothamsted. Addition of other chlorides, e. g. salt, to potassium chloride was injurious, neither kainit nor sylvinite giving the full benefit expected. Manure mitigated this effect to a slight extent. Of the plats receiving complete fertilizer, those getting potassium sulfate produced tubers containing the most dry matter. The tubers produced with low-grade potassium salts (kainit, sylvinite) had the lowest contents of dry matter, even lower than those grown without potassium. The percentage of starch in the dry matter was higher for the potassium sulfate plat than for any of the other salts. The beneficial effect of magnesium sulfate on potatoes at several centers was unexplainable.

Potato improvement work at Svalöf during recent years [trans. title], J. F. LUNDBERG (*Sveriges Utsädesför. Tidskr., 35 (1925), No. 2, pp. 52–58, fig. 1*).—A general review of the work is presented and five varieties, Greta, Brita, Blända, Birgitta, and Magnum Superbum, originated at Svalöf but now distributed, are described. The results of tests conducted in different localities for a series of years show that in most instances these varieties outyielded Up-to-date, with which they were compared, and proved more resistant to leaf curl.

Variations in the composition of Colorado potatoes, N. E. GOLDTHWAITE (*Colorado Sta. Bul. 296 (1925), pp. 3–77*).—Analyses were made on raw and cooked individual tubers of the Burbank, Rural, Brown Beauty, Pearl, King,

Ohio, Irish Cobbler, Peach Blow, Blue Victor, Gold Coin, and Triumph varieties of potatoes. These were variously obtained during several years from hand dug hills and from bulk lots grown under irrigation and on dry land in several districts in the State.

No two tubers of identical composition were found in a variety, or in the same group, or even in the same hill. Size was not found to be a criterion of the maturity of a potato. Potatoes which had the longest growing season seemed the most mature. The percentage of dry matter in potatoes varied inversely with the water content, and generally the percentages of starch and of total carbohydrates varied likewise. Little relationship was apparent between the percentage of nitrogenous matter and ash in potatoes, and agreeable with earlier work in Utah (E. S. R., 2, p. 664), no relation seemed to exist between the amount of irrigation water received and the moisture content of the potato. The quality of potatoes seemed to depend more upon grower, soil, and season than upon variety.

In irrigated potatoes the percentage of dry matter minus 6.71 gives an approximation of the starch percentage. However, wide variations, depending upon the grower, locality, and variety of potato, exist in this possible constant. Among irrigated potatoes, the following approximate ratios between percentages seem to hold: Starch: dry matter 1:1.42; total carbohydrates: dry matter 1:1.15; starch: total carbohydrates 1:1.24; starch: water 1:5 (wide approximation); and total carbohydrates: water 1:3.897 (wide approximation).

The percentage of water in the cortex of potatoes was found less than in the corresponding medullary area, while the reverse was observed in percentages of dry matter, starch, total carbohydrates, and ash. On a fresh basis the percentages of nitrogenous matter did not follow a uniform rule, whereas on a dry basis the percentage of total nitrogenous matter is less in the cortex than in the corresponding medullary area. In general, the composition of potatoes on the dry basis showed as little uniformity as on the fresh basis. On the dry basis only one constant, i. e., starch per cent: dry matter per cent=1:1.25, seemed to hold.

Boiled lengthwise-cut halves of potatoes, cooled and unpeeled, showed nearly the same content of water, dry matter, starch, and total carbohydrates as their corresponding raw halves but less nitrogenous matter and ash. Peeled hot, then cooled, they had less water and correspondingly greater contents of dry matter, starch, and total carbohydrates than their corresponding raw halves and a greater proportional content of nitrogenous matter and ash than the halves peeled uncooled. Steamed lengthwise-halves had a smaller water content than their corresponding raw halves and a greater content of dry matter, starch, total carbohydrates, nitrogenous matter, and ash. Steaming potatoes appeared to extract less of their nitrogenous matter and ash than boiling. Analyses of whole boiled potatoes, comparable only with analyses of corresponding groups of potatoes, are held unsatisfactory. Baked potatoes should have their skins slit open the moment they are done. The resulting loss of water increases their contents of dry matter, starch, total carbohydrates, nitrogenous matter, and ash.

A new variety of sorgo having recurved peduncles, H. B. Cowgill (*Jour. Amer. Soc. Agron., 17 (1925), No. 9, pp. 533–537, figs. 2*).—A new variety of sorgo having a recurving tendency in the peduncle, isolated from an impure population of common Gooseneck sorgo and grown as a distinct sort for two seasons, differs from Gooseneck in spikelet characters and earlier maturity (100–115 days). While less vigorous than Gooseneck it compares well with varieties maturing in the same time, and ranks well in sugar content. The new sorgo has been tentatively designated the Fort Smith Gooseneck.

[The effect of freezing on the germination of acid-treated sugar beet seed], ZWOBODA and H. BAUER (*Ztschr. Zuckerindus. Cechoslovak. Repub.*, *49 (1925), No. 27, pp. 207–209*).—Sugar beet seed treated with sulfuric acid according to the Hiltner method were immediately exposed in a thin layer over night to freezing temperatures. Germination tests revealed a loss of about 25 per cent in germinating energy and 5 per cent in germinability. Exposure of treated seed seems thus liable to reduce the good effect of the treatment. More sulfuric acid was required at the lower temperatures of treatment for effective results.

Sugar losses during storage of sugar beets [trans. title], H. SIMMICH (*Ztschr. Ver. Deut. Zuckerindus.. No. 826 (1925), pp. 493–503, fig. 1*).—Sugar beets taken from within a pile were exposed for 12 days to winter temperatures varying from 2 to 6.5° C. (35.6 to 43.7° F.) and were then replaced in the pile. During the experiment the pile temperature ranged between 6 and 8.5° and was independent of outside variations. After 8 weeks beets not exposed to cold were somewhat spoiled and showed growth and during the 9.5 weeks had lost in polarization and gained in invert sugar, while the cooled beets and their sugar content were practically unchanged.

In warmer weather beets were withdrawn from a pile and artificially cooled for 3 days, the temperature ranging from 4.5–6 to 11°. They were replaced in the pile for 4 weeks, at the end of which the pile temperature attained 25°. Although somewhat altered on removal, they showed an average polarization of 10.68 with 0.98 per cent of invert sugar, as compared with 5.26 and 3.3, respectively, in the untreated beets.

Soaking wilted stored beets, topped or untopped, in water for 24 hours caused them to gain in weight from 0.9 to 3 per cent. From 0.02 to 0.3 per cent of sugar was lost in the water, but the invert sugar content remained practically constant.

The storage of mother beets, D. A. PACK (*Facts About Sugar, 20 (1925), No. 37, pp. 874, 875*).—Conditions to be observed in the storage of mother sugar beets are described, with suggested modifications of present storage methods.

Studies in the chemistry of sugarcane.—II, Some factors that determine the ripeness of sugarcane, B. VISWANATH and S. K. AYYAR (*India Dept. Agr. Mem., Chem. Ser., 7 (1924), No. 6, pp. 123–144, figs. 4*).—Previous studies[5] showed that in young and consequently immature cane, the difference between a bottom internode and a top internode in the contents of total solids calculated as sucrose is very great and in favor of the lower. As the cane becomes older and more mature the difference tends to disappear, and is even reversed in favor of the top internode.

Further work confirmed the early observations, investigations involving several varieties indicating that purity alone is not always a reliable criterion for judging the maturity of sugar cane. The ratio of the Brix of the juice of the top half of the cane: Brix of the juice of the bottom half was found to be useful and accurate in testing the stage of maturity of a cane.

Report on the sugar-cane experiments for the season between 1922–1924, J. R. BOVELL and J. P. D'ALBUQUERQUE (*Barbados Dept. Agr., Rpt. Sugar-Cane Expts., 1922–1924, pp. [1]+63*).—Experiments with sugar cane in Barbados (E. S. R., 52, p. 636) comprised trials of varieties, seedlings, and fertilizers, and comparisons of several types of cuttings. Tabulations show rainfall data, prevalence of the root borer and the brown hard back, and comparative yields of cane varieties on different soils.

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[5] Agr. Jour. India, 14 (1919), No. 3, pp. 440–475, pls. 2, fig. 1.

Statistics on the distribution and production of sugar cane varieties in Java in 1924 [trans. title], J. van Harreveld (*Arch. Suikerindus. Nederland. Indië, Meded. Proefsta. Java-Suikerindus., 1925, No. 5, pp. 169–250, figs. 2*).—The data tabulated regarding the distribution and yields of sugar cane varieties in Java supplement earlier records (E. S. R., 51, p. 237). Varieties in order of importance were E. K. 28, D. 1. 52, 247 B., E. K. 2, 90 F., S. W. 3, 2714 P. O. J., and 100 P. O. J., occupying, respectively, 43.75, 22.5, 12.5, 6.25, 3, 3, 2, and 1.5 per cent of the total acreage planted to cane on the island.

Tillage investigations relating to wheat production, M. C. Sewell and L. E. Call (*Kansas Sta. Tech. Bul. 18 (1925), pp. 4–55, figs. 7*).—Systematic field studies of tillage carried on since 1909 dealt with the effect of time and depth of plowing on the yield of wheat grown continuously and wheat grown in rotation with corn and oats. A recent test where wheat was grown continuously had to do with depth and frequency of plowing and methods of incorporating straw.

The time of tillage appeared to be the most important factor in the preparation of land for wheat, an average difference of about 11 bu. per acre between July and September plowing being recorded in favor of the earlier date. Depth of plowing did not vary the yield in two of three different experiments. Yields of wheat can probably be maintained without annual deep plowing, once in three years possibly sufficing for maximum yields. Early summer tillage increased the amount of soil moisture and nitrates in comparison with late summer tillage. While depth of plowing did not cause variation of soil moisture, 7-in. compared with 3-in. plowing showed an increase in nitrate accumulation. Since plowing in July resulted in greater nitrification and higher yields than no plowing with the soil scraped to eliminate weeds, plowing seems beneficial for other reasons than killing weeds.

Turning under about 1.5 tons of straw per acre in July or disking the straw into land immediately after plowing in July caused a slight increase in the yield of wheat, whereas either applying straw as a top-dressing during the winter or burning the stubble before plowing decreased yields.

The authors assert that production costs can be lowered by timely tillage and by using crop rotations. Wheat grown continuously upon the same land is subject to plant diseases and insect attack even when the best known methods of seed bed preparation are practiced.

Wheat seedbed preparation, M. C. Sewell (*Abs. in Jour. Amer. Soc. Agron., 17 (1925), No. 10, pp. 644, 645*).—Significant points in this paper are discussed in detail in the above publication. "During a 15-year study of wheat production at the Kansas Experiment Station the average yields showed that the best crop insurance is to grow wheat in a rotation and to prepare the seed bed by plowing in July, subsequently cultivating when necessary to destroy weed growth."

The value of fallowing for wheat (*Agr. Gaz. N. S. Wales, 36 (1925), No. 8, pp. 545–547*).—The average acre production of wheat on 149,894 acres of new land, 1,583,047 of fallow land, and 1,780,069 acres of stubble land in New South Wales harvested for grain during the season 1924–25 was, respectively, 14.8, 19.7, and 14.8 bu.

Cutting back winter wheat [trans. title], R. Torssell (*Landtmannen, 8 (1925), No. 23, pp. 427–429, 430, figs. 2*).—The practice of cutting back rapidly growing winter wheat to prevent lodging is discussed, and experiments made to study its effect are reported. In the trials made wheat of heavy growth standing about 2 ft. high was cut back to about 18 in. approximately a week before the appearance of the heads. The treated wheat produced more grain and less but stronger straw than was secured from wheat allowed to mature

in the usual manner. It is pointed out that cutting back retards growth to a very perceptible extent, so that the favorable results that may be expected from this practice are largely determined by seasonal conditions.

Comparative value of Kota and Marquis wheats for milling and bread making, J. A. Clark and J. H. Shollenberger (*Northwest. Miller, 143 (1925), No. 11, pp. 1102–1104, figs. 2*).—Milling and baking experiments were made in the experimental mill and baking laboratory, U. S. Department of Agriculture, with 101 comparable samples of each of Kota (E. S. R., 50, p. 33) and Marquis wheats obtained from many localities in the Northwestern States and representing crop years from 1918 to 1924, inclusive. Flour produced in the experimental mill compared favorably with patent flour milled by a large commercial milling company.

The respective averages obtained for Kota and Marquis were bushel weight 60.1, 57.5 lbs.; crude protein content of wheat 14.7, 13.9 per cent; yield of straight flour 73.8, 71.3 per cent; water absorption of flour 65.1, 59.8 per cent; volume of loaf 2,288, 2,260 cc.; weight of loaf 511, 500 gm.; texture of crumb score 91.3, 89.5; color of crumb score 90.1, 90.9; ash in flour 0.55, 0.51 per cent; and gasoline color value 1.41 and 1.21 per cent.

Statistical analyses of the comparable milling and baking results showed Kota to be significantly poorer than Marquis in color of crumb, ash in flour, and color of flour, similar in volume of loaf, and significantly better in the other factors listed above. Kota was significantly less variable than Marquis in bushel weight and yield of straight flour and not significantly different in variability in the other factors. The yield of shorts from Kota was the same as from Marquis, but the bran yield was considerably lower. Available information shows Kota to be a harder milling wheat, producing a more granular flour, and to have a decidedly shorter fermentation period and usually a creamier shade of crumb.

Some aspects of Kota wheat, L. R. Waldron (*Northwest. Miller, 143 (1925), No. 12, p. 1200*).—This contribution from the North Dakota Experiment Station discusses the yields of Kota wheat in North Dakota in comparison with Marquis and other wheat, points out the agronomic qualities of Kota, and reports the average results of milling and baking trials by the station and by the U. S. Department of Agriculture with over 60 comparably grown North Dakota samples of Marquis and Kota wheats.

The respective averages for Kota and for Marquis were acre yield 20.7, 18.1 bu.; weight per bushel 59.4, 56.4 lbs.; protein 14.1, 13.1 per cent; flour yield 74.6, 71 per cent; water absorption of flour 61.4, 58.6 per cent; loaf volume 2,373, 2,336 cc.; loaf weight 489, 483 gm.; texture score 90.7, 90.4; color score 90.9, 90.7; and ash 0.545 and 0.518 per cent.

Millers of the Northwest hold adverse views on the value of Kota wheat (*Northwest. Miller, 144 (1925), No. 7, pp. 665, 666*).—"Millers have been reluctant to accept the findings of the Department of Agriculture agronomists as to the milling and bread-making value of Kota wheat, the new hard red spring variety that has gained the Department's enthusiastic support. A symposium of opinions gathered by *The Northwestern Miller* from representative millers of the principal spring wheat States of the Northwest presents almost a unanimous negative. Those who have given it an extensive trial are outspokenly opposed to it, and those who have not are generally skeptical."

Cultivation of wheat and other cereals in Roumania, A. Munteanu (*Internatl. Rev. Sci. and Pract. Agr. [Rome], n. ser., 3 (1925), No. 2, pp. 338–349, pls. 14*).—The characteristics of the principal varieties of wheat, corn, barley, oats, and rye cultivated in Rumania are described, with comment on cultural practices, areas grown, and total production of each crop.

The amended New York seed law and seed testing, M. T. Munn (*New York State Sta. Bul. 528 (1925), pp. 3–22, figs. 5*).—This is a revision of Bulletin 476 (E. S. R., 44, p. 439), and sets forth changes in the New York seed law which were effective September 1, 1925.

How long do the various seed species retain their germination power? [trans. title], K. Dorph-Petersen (*Tidsskr. Planteavl, 31 (1925), No. 2, pp. 338–352*).—The results here reported have been previously noted from another source (E. S. R., 52 p. 340).

The origin of false wild oats, C. L. Huskins and J. R. Fryer (*Sci. Agr., 6 (1925), No. 1, pp. 1–13, figs. 9*).—A review of the literature gave evidence that the aberrant forms of Avena, termed "false wild oats," differ by only one obvious character complex from the cultivated variety in which they arise, this consisting of the long, twisted, geniculate awn, the large, ring-shaped basal articulation, and the stiff hairs surrounding this "sucker-mouth" on both the upper and lower grains of all spikelets. False wild oats seem to originate from *A. sativa* varieties through some spontaneous change occurring in a gamete. Such an abnormal gamete will usually mate with a normal gamete and give rise to a heterozygous false wild oat plant which will segregate to give the original pure variety, heterozygous false wild oats, and homozygous false wild oats, generally in a ratio of 1:2:1. In this connection see an earlier note (E. S. R., 53, p. 829).

Most significant from the practical viewpoint are the indications that false wild oats apparently have no direct connection with *A. fatua* and that they do not have the property of delayed germination characteristic of the true wild oat. While false wild oats evidently can not give rise to *A. fatua* and lacking delayed germination can easily be destroyed by proper methods of cultivation, nevertheless their coarse awns, small percentage of kernel, and easy shattering habit make them very desirable impurities in seed oats.

HORTICULTURE

[Horticultural investigations at the Summerland, B. C., Experimental Station, 1924], W. T. Hunter (*Canada Expt. Farms, Summerland (B. C.) Sta. Rpt. Supt. 1924, pp. 30–61, fig. 1*).—As previously reported (E. S. R., 53, p. 840), the hairy vetch cover crop treatment was the most successful in respect to yield of various methods of culture tested in an irrigated apple orchard. On the station grounds the planting of filler trees in an apple orchard with permanent trees 30 ft. apart on the square failed to give satisfactory results, since crowding occurred before profitable production was reached. Jonathan breakdown studies, conducted cooperatively with the Central Experimental Farm and the Dominion Fruit Branch, are again discussed in detail (E. S. R., 52, p. 538).

Attempts to ascertain means of determining the proper stage of maturity for picking apples led to the suggestion that changes in the ground color from leaf green to yellowish shades are the most reliable indexes. With some varieties such as Wealthy and Jonathan, two or more pickings may be justified. With light colored varieties such as Grimes and Yellow Newtown the fruit may be harvested at one time.

Experiments with apples indicated the inadvisability of pruning trees to any stereotyped form, it being found more satisfactory to guide the trees according to their varietal inclination. The modified leader was generally more satisfactory than either the full leader or the open type.

Of several gradations in thinning apple fruits on young, vigorous trees, light thinning was more satisfactory than heavy, moderate, or none, yielding a

larger proportion of extra fancy and fancy apples. No effect of thinning on the bearing habit of trees was noted. Time of thinning tests, begun in 1924, suggested that thinning previous to the June drop had no effect on its occurrence. Thinning was performed most expeditiously when the fruits were no larger than walnuts. Even late thinning affected the size of the remaining apples.

Bark, cleft, and inlay grafting were successfully utilized in top-working apple trees. Paraffin was found to be a satisfactory substitute for grafting wax, provided it was used in the proper consistency.

Attempts to increase the size of Winesap apples by fertilizing with various manures led to the observation that factors other than soil fertility are concerned.

The results of variety tests with numerous fruits, vegetables, and flowers are briefly reported.

Fruiting habit and pollination of cantaloupe, J. T. Rosa (*Amer. Soc. Hort. Sci. Proc., 21 (1924), pp. 51–57*).—Careful observations at the California Experiment Station upon the growth and fruiting habits of cantaloupes showed a marked periodicity in fruit setting. During the middle portion of the blossoming season practically none of the many perfect flowers could be made to set fruit, regardless of the method of pollination practiced.

An examination of 65 varieties growing at Davis in 1923 showed all producing only staminate and perfect flowers. At Meloland, one unknown Peruvian variety bore pistillate blooms. Self-pollination tests at Davis showed all varieties to be self-fruitful when fertilized with pollen from staminate blooms on the same vine. Without artificial pollination, protected perfect blossoms failed to set fruit, indicating that insects are necessary agents in normal field cantaloupe pollination. Normal fruits containing viable seeds were obtained with pollen taken from the same flower or from other flowers on the same plant, and also from intervarietal crosses such as Salmon Tint by Honey Dew, Persian, Hoodoo, and Casaba. Seeds of the greatest average weight and the highest specific gravity were obtained from fruits ripening during the cooler part of the season.

An injurious factor affecting the seeds of Phaseolus vulgaris soaked in water, J. Tilford, C. F. Abel, and R. P. Hibbard (*Mich. Acad. Sci., Arts, and Letters, Papers, 4 (1924), pt. 1, pp. 345–356, fig. 1*).—Studies upon the cause of the rapid loss of viability in beans when immersed in nonagitated tap water held at ordinary room temperature (20° C.) led to the conclusion that lack of aeration and the presence of decomposing bacteria are the lethal agents. Disinfected seeds placed in sterile receptacles containing sterile water aerated by forced introduction of sterile air gave 88 per cent germination after 72 hours' immersion, as compared with 27 per cent for seeds in aerated ordinary water and 0 per cent for seeds in nonsterile, nonagitated water.

Essentials of systematic pomology, B. D. Drain (*New York: John Wiley & Sons; London: Chapman & Hall, 1925, pp. V+284, figs. 106*).—Designed primarily as a textbook for college teaching, there is incorporated much material of general interest and value.

Prune the bearing apple tree, R. H. Roberts (*Wisconsin Sta. Bul. 378 (1925), pp. 36, pl. 1, figs. 29*).—An illustrated discussion of the principles and practices of pruning bearing apple trees, which the author points out, because of differences in inherent fruiting habits, vegetative conditions, and previous treatment, can not be pruned according to any single system, but must receive special individual consideration. Without pruning, the bearing apple tree soon becomes crowded with weak, run-out wood, incapable of producing high-grade fruit and tending to force production to the top of the tree and the extremes

of the branches. It is pointed out that too little or too much vegetative growth is detrimental to bearing. Moderate annual pruning during the dormant season promotes the development of strong growth, capable of sustained fruit production, and also serves to open up the tree for the entrance of sunlight. The removal of a considerable amount of weak wood will not adversely affect production, since only a relatively small proportion of the total blossoms are needed to insure satisfactory yield. The association of fruitfulness with a balanced condition of chemical composition and growth makes it necessary to base the pruning treatment of a tree upon its vigor and the habit of growth.

Autumn development of peach fruit buds, J. S. Bailey (*Amer. Soc. Hort. Sci. Proc., 21 (1924), pp. 30–33, pl. 1*).—An explanation of the reason peach fruit buds in the orchard of the Massachusetts Experiment Station perished at a temperature of −14° F. one winter, after surviving −15° the preceding year, is deemed by the author to lie in the greater fall development of buds preceding the disastrous season. October of the fall preceding the injury was characterized by an unusual amount of sunshine, which is thought to have advanced the buds to a susceptible stage. The stimulating effects of bright sunlight were also shown in weekly examinations of buds during the autumns of both seasons.

Correlation of root and top growth of the Concord grape and translocation of elaborated plant food during the dormant season, H. W. Richey and H. A. Bowers (*Amer. Soc. Hort. Sci Proc., 21 (1924), pp. 33–39, pls. 2*).—Utilizing as material Concord grapevines planted in deep wooden boxes filled with fertile soil, the authors were unable to find any appreciable movement of carbohydrates from the canes to the roots during the dormant season. From October 27 to January 8 the percentage of total carbohydrates increased in the canes, stems, and roots, the high point coinciding quite closely with the initiation of growth. The curves for free reducing disaccharides and total sugars closely resembled that of total carbohydrates. Accompanying the high point in sugars, there was a low point in polysaccharides, leading to the assumption that hydrolytic action on the part of plant enzymes occurred. On the basis of percentages of dry weight, the vine stored most of its reserves in the form of starch.

On the average, vines with two shoots were larger and produced more top and root than did one-cane vines. Large leaf area was corrrelated with large amount of growth. The diameter of the cane of single-shoot vines was greater than that of either cane on two-shoot vines.

Seasonal changes in the chemical composition of the Concord grape vine, A. L. Schrader (*Amer. Soc. Hort. Sci. Proc., 21 (1924), pp. 39–44*).—Studies at the University of Maryland upon the seasonal changes occurring in the chemical composition of Concord vines corroborated the results presented above, namely, that there is no appreciable translocation of carbohydrates during the dormant season. Microchemical tests indicated that starch comprises a large part of the abundant reserve food supply. Changes in composition during the dormant season are ascribed to the hydrolysis of polysaccharides.

The finding in 1-year-old vines of approximately 75 per cent of the total carbohydrates and 80 per cent of the total nitrogen in the roots is deemed an explanation of the satisfactory recovery usually following severe top pruning at the beginning of the second season. During the period of fruit enlargement, only slow changes occurred in the percentage of carbohydrates in the bearing nodes. Thereafter carbohydrate reserves again accumulated. In respect to individual nodes, it was found that during the growing season

fruit bearing nodes Nos. 2, 3, and 4 were relatively low in reducing substances as compared with nodes 5, 6, and 7.

As a practical deduction, it is suggested that the fairly constant carbohydrate content of canes during the dormant season makes the time of pruning or of taking cuttings of little importance.

Variations of plat yields in field experiments with the grape and their interpretation, F. E. GLADWIN (*Amer. Soc. Hort. Sci. Proc., 21 (1924), pp. 45-51*).—Records taken upon the weight of fruit and prunings on carefully laid out plats in an experimental vineyard operated by the New York State Experiment Station revealed, previous to the application of the differential treatments, differences in both growth and yield which in the ordinary procedure would have been acceptable evidence of the effects of differential treatments. The author believes that the contrary results obtained may be due to either soil or plant variations or both, and suggests that at least five years might be profitably spent in determining the true producing capacities of plants and soil previous to the actual initiation of the experiment. Furthermore, until systematic errors are known, it is not deemed safe to subject data to statistical analysis with the expectation of obtaining the correct interpretations.

Bud selection in the Washington Navel orange.—IV, Progeny tests of limb variations of the ribbed strain, A. D. SHAMEL, C. S. POMEROY, and R. E. CARYL (*Jour. Heredity, 16 (1925), No. 11, pp. 415-422, figs. 4*).—Continuing their contributions (E. S. R., 54, p. 228) on the results of progeny tests of limb variations in the orange, the authors discuss in the present paper work with an offtype ribbed-fruited strain characterized not only by misshapen fruits but also by poor color and inferior quality. Records taken separately for each progeny tree show during the five years up to and including the 1924-25 season that all fruits have conformed strictly to the parental type. Similar results were secured with scions top-worked into a normal tree.

The minimum temperature for growth of the date palm and the absence of a resting period, S. C. MASON (*Jour. Agr. Research [U. S.], 31 (1925), No. 5, pp. 401-414, figs. 4*).—Careful observations taken in the field and in the greenhouse upon the leaf development in the date palm (*Phoenix dactylifera*), a plant which under favorable environment was found to continue its growth throughout the entire year, indicated that the zero point for growth is in the vicinity of 50° F. Records taken at the United States date garden at Indio, Calif., showed that growth, after a characteristic slowing down, ceased entirely with minimum temperatures well above freezing, provided the maximum mid-day temperatures failed to go above 50°. In the case of potted young date palms held in a control chamber in a greenhouse, all growth ceased below 49°.

Partial thermostasy of the growth center of the date palm, S. C. MASON (*Jour. Agr. Research [U. S.], 31 (1925), No. 5, pp. 415-453, pls. 5, figs. 6*).—The ability of the date palm to survive, without permanent injury, temperature extremes as low as 4° F. and as high as 125° is deemed by the author to lie in the peculiar structure and habit of growth of the plant. The active growing tissue is located in a giant terminal bud, termed a phyllophore, which, because of a highly nonconducting and insulating protective envelope, composed of thick, fibrous leaf bases and lower down of the outer zone of the trunk itself, is not subject to rapid fluctuations in temperature. Furthermore, a marked correlation was noted between the temperature in the center of the phyllophore and that of the soil in the vicinity of the growing roots, indicating that the ascending sap current, itself protected from loss in temperature in its upward passage by the thick outer portion of the trunk, is

instrumental in modifying the temperature of the phyllophore. The daily range of temperature in the growth center rarely exceeded 7 to 8°, while on the hottest day during record-taking the temperature of the bud center was found to be 32° cooler and on the coldest day 26° warmer than that of the surrounding air. The function of the sap stream in modifying the temperature of the growth center is thought to explain the ability of the date palm and other endogenous plants to survive and thrive under adverse temperature conditions such as exist in the desert.

The inhibitive effect of direct sunlight on the growth of the date palm, S. C. Mason (*Jour. Agr. Research [U. S.], 31 (1925), No. 5, pp. 455–468, figs. 3*).—Auxanometer records of the growth of date palm leaves in the United States date garden at Indio, Calif., showed that normal growth, as manifested in the pushing up of the leaves from the growth center, is made chiefly in the time between sunset and sunrise. Reduced growth occurs in daylight when direct sunlight is cut off by clouds. In full sunlight, the date palm leaf entirely ceases elongation. Inclosure in a dark chamber at any hour of the day induced resumption of growth. The light of Mazda electric lamps failed to stop growth, while that from Cooper-Hewitt lead-glass mercury vapor tubes was as effective as direct sunlight in inhibiting development. Since the light of the Cooper-Hewitt tubes is confined to rays from the shorter wave lengths of the visible spectrum through violet, blue, green, and yellow to about the line D (0.578μ), it is concluded that the inhibiting effect of intense sunlight in the desert region is due chiefly to the action of rays of wave length from about 0.57μ in the yellow to about 0.405μ in the violet end of the visible spectrum. However, invisible ultra-violet rays probably assist in stopping growth. Growth in the absence of direct sunlight is apparently synchronous with the closing of the stomates, checking of transpiration, and increased turgescence in the meristematic tissue.

Dutch bulbs, their history and treatment, J. F. C. Dix, trans. by T. J. Bakker (*Haarlem, Netherlands: H. A. van Olphen, pp. 31, pls. 10*).—Illustrated in color, this pamphlet contains cultural and varietal notes on the hyacinth, tulip, narcissus, and other Dutch bulbs.

Hardy bulbs for amateurs, J. Jacob (*London: Country Life, Ltd.; New York: Charles Scribner's Sons, 1924, pp. VII+108, pls. 15*).—A popular discussion of the culture, variety selection, and utilization of common and unusual bulbous plants.

Garden craftsmanship in yew and box, N. Lloyd (*London: Ernest Benn, 1925, pp. 36, pls. 54, figs. 7*).—A discussion of planting, cultivation, and pruning.

FORESTRY

The structure of the maple-beech association in northern Michigan, H. A. Gleason (*Mich. Acad. Sci., Arts, and Letters, Papers, 4 (1924), pt. 1, pp. 285–296*).—Studies of the species composition of the forests of the northern end of the Lower Peninsula of Michigan showed the sugar maple to be the dominant species, with beech, birch, elm, and basswood as important codominants, the proportion of each being dependent upon the available moisture. The flora of the association includes some 200 species of vascular plants, about a score of which are regarded as characteristic. Certain species are deemed to be chance invaders from neighboring associations or, like the hemlock, survivals from an earlier occupation by coniferous forest. It is believed that the hardwood forest in this region is still relatively young from a historical standpoint, and may have attained its full ecological dominance only about three centuries ago.

Canary Island pine (Pinus canariensis), D. R. Moore (*Aust. Forestry Jour., 8 (1925), No. 10, pp. 262–264, figs. 2*).—A brief article concerning the Canary Island pine, a species considered of value on account of its rapid growth, the strength of the wood, and ease of culture.

The story of the sequoias, E. L. Guppy (*Pasadena: Post Printing & Binding Co., 1925, pp. 31, figs. 4*).—Information of a popular nature concerning the history of the redwoods, their present condition, and interesting features of the Sequoia forests of California.

Some Chinese trees and tree products, F. L. Chang (*China Jour. Sci. and Arts, 2 (1924), No. 6, pp. 564–570; 3 (1925), No. 2, pp. 96–102*).—An article of general interest concerning important Chinese trees, their distribution, uses, etc.

The forests of Lee County, Virginia, H. L. Baker (*Va. Geol. Survey Bul. 26 (1925), pp. 179–207, pls. 5*).—A discussion of the forestry situation with reference to species, lumber output and uses, fire hazards, possibilities of future development, etc.

France and her forests, R. W. Westwood (*Nature Mag., 7 (1926), No. 1, pp. 36–38, figs. 3*).—A general article relating to the reforestation activities in the war-devastated regions of France.

Forest resources of Siberia, B. Baievsky (*U. S. Dept. Com., Bur. Foreign and Dom. Com., Trade Inform. Bul. 378 (1925), pp. II+39, figs. 3*).—Herein is presented general information concerning the forests of Siberia, their location, accessibility, species composition, present administration, and potential possibilities for exploitation.

[Reports of forest administration in Baluchistan for the years 1922–23 and 1923–24], B. Ram (*Baluchistan Forest Admin. Rpts., 1922–23, pp. [2]+27; 1923–24, pp. VIII+27*).—These are the usual administrative reports (E. S. R., 49, p. 240).

Progress report of forest administration in Coorg for 1923–1924, V. G. Darrington (*Coorg Forest Admin. Rpt. 1923–24, pp. [38]*).—This is the usual administrative report (E. S. R., 53, p. 146), including a brief review of the forest administration for the period 1919–20 to 1923–24.

Progress report on forest administration in the Punjab for the year 1923–24, W. Mayes (*Punjab Forest Admin. Rpt. 1923–24, pp. II+[61]+CCCXCV, pl. 1*).—This report, consisting for the greater part of statistical data relating to the utilization of revenues, expenditures, etc., is the usual annual administrative statement (E. S. R., 51, p. 146).

Tables of bark deductions from logs, S. H. Howard (*[Indian] Forest Bul. 65 (1925), pp. 11*).—Among species considered in this brief circular are *Cedrus deodara, Dalbergia sissoo, Dipterocarpus tuberculatus, Pinus longifolia, Quercus incana, Shorea robusta,* and *Tectona grandis.*

DISEASES OF PLANTS

Atlas of diseases of agricultural plants, Ser. I, A. Dressel, O. Appel, and E. Riehm (*Atlas der Krankheiten der Landwirtschaftlichen Kulturpflanzen. 1. Reihe. Berlin: Paul Parey, 1924, pp. 46, pls. 22*).—This plant disease atlas, first series, comprises 22 colored plates, 31 by 45 cm. (12 by 18 in.) in size, with descriptive text separately bound. The plates show disease phases or stages in cereals, clover, potato, beets, beans, peas, crucifers, cucumbers, and orchard fruits.

Bibliography of the literature of plant protection [trans. title], H. Morstatt (*Biol. Reichsanst. Land u. Forstw. Berlin-Dahlem, Bibliog. Pflanzenschutzlit., 1914–1919, pp. VIII+463; 1920, pp. 71; 1921, pp. 198; 1922, pp. IV+162; 1923, pp. IV+176; 1924, pp. IV+226*).—This bibliography, in systematic

form, of plant protection literature is in sections corresponding to the war period, 1914–1919, and the years, separately, 1920, 1921, 1922, 1923, and 1924.

Physiological aspects of parasitism, V. H. BLACKMAN (*Brit. Assoc. Adv. Sci. Rpt., 92 (1924), pp. 233–246, figs. 2*).—It is recognized that disease is abnormal physiology, though as yet, owing to inadequate methods, it is not possible to distinguish the special reactions in the host which the clash of its normal physiological processes with those of the parasite produce. Immunity in plants is naturally (hereditarily) transmitted, not individually acquired, as is or may be the case with animals. The field of inquiry as to the effect of environment on the liability of the plants to disease is largely unworked. The class of infectious diseases in which the degree of natural resistance can be, at present, markedly enhanced by good cultivation, though large is now of little significance, as such diseases become important only when unfavorable growth conditions occur. The problem of such diseases is and must remain complex, though great interest attaches to experimentation in this field.

"A consideration of the nature of disease resistance in plants thus leaves us with no expectation of finding means for endowing plants with artificial disease resistance. Apart from the protection of plants from infection . . ., our chief hope of combating disease lies in two directions—one, that of breeding disease-resistant forms of plants, and the other that of the enhancement of the natural resistance of the plant. . . . Clearly it is on plant physiology that plant pathology is largely dependent, not only for the elucidation of the relationship of host and parasite, but also for fundamental scientific knowledge which may profoundly affect economic practice."

Loss of virulence in fungi, C. D. LARUE (*Science, 62 (1925), No. 1600, pp. 205, 206*).—The author proposes making a study of the reported loss of virulence of fungi when grown in cultures to test a hypothesis that such loss is due to mutations appearing after the fungus is grown as a saprophyte instead of in its normal parasitic habitat. He desires reports of well-substantiated occurrences of this phenomenon to be investigated.

The temperature of fungicidal solutions [trans. title], E. VOGT (*Nachrichtenbl. Deut. Pflanzenschutzdienst, 4 (1924), No. 9, pp. 62–64*).—To the usual factors of cereal seed treatment, namely, concentration and duration of the treatment, the author has added the factor temperature. The comparative results thus far obtained are indicated, with brief discussion of trials, employing different concentrations, periods, and temperatures, with water (control), copper sulfate, Weizenfusariol, Uspulun, Germisan, Hohenheimer Beize, formaldehyde, and Kalimat.

[Plant diseases, British Columbia], M. H. RUHMANN (*Brit. Columbia Dept. Agr. Ann. Rpt., 18 (1923), pp. 47, 48*).—In this portion of the entomological report is given condensed information regarding apple tree anthracnose (*Glomerella rufomaculans*), apple mushroom root rot (*Armillaria mellea*), powdery mildew (*Podosphaera oxyacanthae*), scab (*Venturia pomi*), and silver-leaf (*Stereum purpureum*); alfalfa leaf spot (*Pseudopeziza medicaginis;* a broad bean disease (*Sclerotinia* sp.); the bacterial diseases fire blight (*Bacillus amylovorus*) and crown gall (*B. tumefaciens*); and a few plant diseases nonparasitic or undetermined as to character or causation.

Report of provincial plant pathologist, Vancouver, J. W. EASTHAM (*Brit. Columbia Dept. Agr. Ann. Rpt., 18 (1923), pp. 41–43*).—Brief discussion of the Colorado potato beetle is included with this account, which deals briefly also with mangel seedling root blight (*Phoma betae?*), mangel heart rot (*P. betae*), white pine blister rust, fire blight, and the plant disease survey in central British Columbia.

Fungus parasites of cultivated plants [trans. title], J. B. MARCHIONATTO (*Rev. Facult. Agron. La Plata, 3. ser., 15 (1923), No. 2, pp. 83–92, pls. 4*).—Parasitic fungi here reported as observed during 1922–23 include *Cercospora violae-tricoloris*, in leaves of *Viola tricolor; Colletotrichum carica*, in leaves of *Ficus carica; Entyloma fuscum*, in leaves of *Papaver somniferum; Hadrotrichum? populi*, in leaves of *Populus nigra pyramidalis; Phoma destructiva*, in green and ripe fruits of *Lycopersicum esculentum*; *Phyllosticta vincicola*, in leaves of *Vinca major; P. amaranthi*, in leaves and stems of *Amaranthus melancholicus tricolor; P. hydrangeae*, in leaves of *Hydrangea hortensia; Puccinia endiviae*, in leaves of *Cichorium endivia; Septoria aesculi*, in leaves of *Aesculus hippocastanum; S. antirrhini*, in leaves and stalks of *Antirrhinum majus; S. curvata*, in leaves of *Robinia pseudacacia; S. daturae*, in leaves of *Datura fastuosa; S. exotica andersonii*, in leaves of *Veronica andersoni; S. lobeliae*, in leaves and stems of *Lobelia erinus;* and *S. teucrii*, in leaves of *Teucrium fruticans*.

Report of the phytopathological service, 1922 [trans. title], N. VAN POETEREN (*Verslag. en Meded. Plantenziektenkund. Dienst Wageningen, No. 31 (1923), pp. 59*).—Besides the usual report (E. S. R., 49, p. 242) on personnel and activities, somewhat detailed accounts are given regarding soil sterilization experiments employing cresol, carbolic acid, ammonium carbonate, and copper sulfate; tests employing various agencies against nematodes; and studies in connection with various diseases of different plants, notably potatoes, cereals, and gooseberries.

Insect pests and cane diseases [Philippine Islands, 1924], G. H. PRITCHETT (*La. Planter, 73 (1924), No. 24, pp. 470–472*).—Besides brief accounts of such cane-infesting insects as white ants, white louse, borers, cane grubs or root borer, and of the plant *Aeginetia indica* parasitic on cane roots, notice is briefly given regarding sugar cane rust, gum, smut, pineapple disease or black rot, leaf spot, Fiji disease, and mosaic. The last two of these constitute the diseases of major importance in the Philippines, both being here discussed in connection with varietal susceptibility and resistance.

Thread blights, T. PETCH (*Ann. Roy. Bot. Gard. Peradeniya [Ceylon Jour. Sci., Sect. A], 9 (1924), No. 1, pp. 1–45, pls. 9*).—A brief historical review of thread blights introduces a systematic account of such blights, chiefly from a morphological point of view, which indicates certain peculiarities of the cords which, it is thought, may assist in correlating the species of different countries.

Cereal smut [and control] [trans. title], GUYOT (*Jour. Agr. Prat., n. ser., 42 (1924), Nos. 48, pp. 433, 434; 49, pp. 461, 462*).—A brief review to date is given of materials, measures, and results in seed treatment of wheat smut.

A root rot of alfalfa, L. W. DURRELL and W. G. SACKETT (*Science, 62 (1925), No. 1595, pp. 82, 83*).—A brief account is given of a root rot of alfalfa which is said to have made its appearance in Colorado fields. The disease is reported to manifest itself on plants three or more years old as a flagging of the shoots in the early spring. After remaining in a wilted condition for some time the shoots die, and they are not replaced. Sections of roots show the vascular system plugged with a yellow substance which gives a reaction of wound gum. Diseased roots are said to be able to conduct only about one-fourth the normal water requirement of the plant.

From diseased roots a fluorescent bacterium has been isolated, and inoculations have reproduced the field symptoms of the disease.

Cotton diseases [trans. title], J. COSTANTIN (*Agron. Colon., 11 (1924), No. 79, pp. 1–6, figs. 2*).—Information here briefly outlined regarding cotton diseases in regions having climatic conditions analogous to those in French cotton-producing areas in Africa is limited to Texas cotton root rot, with reference

to contributions by King (E. S. R., 49, p. 246; 50, pp. 146, 747), Taubenhaus and Killough (E. S. R., 50, p. 45; 53, p. 647), and Taubenhaus (E. S. R., 51, p. 544).

[Peanut wilt in Argentina] [trans. title], J. B. MARCHIONATTO (*Rev. Facult. Agron. La Plata, 3. ser., 15 (1922), No. 1, pp. 65–67, pls. 2*).—*Sclerotinia trifoliorum* appeared on an experimental plat of peanuts (*Arachis hypogaea*) early in January, 1921, attacking commonly the roots and stems and less frequently the leaves, the plants affected showing leaf wilt and finally drying up. The fungus is said to pass through development corresponding to that of *S. libertiana*. Remedial or preventive measures consist in destroying affected plants, rotation, and management tending to prevent excess of soil moisture.

The Rhizoctonia disease of potatoes, B. F. DANA (*Washington Col. Sta. Bul. 191 (1925), pp. 5–78, figs. 13*).—The author describes the symptoms, effects, and methods of control, as developed by prolonged investigations, of the potato disease caused by different stages of *R. solani*.

The fungus is said to be indigenous to western soils, and persists under cultivation as a parasite on many plants and as a saprophyte on plant remains in the soil. It is reported to occur in some stage on 39 cultivated and 15 wild host plants.

It is said to attack the potato plant at all stages, the direct injury being confined to the root system or other subterranean structures. The yield of marketable tubers is directly influenced by the disease. Some symptoms such as rosette, giant hill, and other abnormalities of top may accompany severe Rhizoctonia disease of potatoes, but they have no relation to the disease other than that of association.

The author considers seed selection as affording one means of controlling Rhizoctonia. Seed treatment with corrosive sublimate to kill the resting form of the fungus on the seed tubers is recommended as a preventive measure. The dates of planting and harvesting are said to influence the amount of disease in the crop, lower temperatures and favorable conditions at the beginning and end of the growing season accounting for an increase of the disease in early plantings and on tubers left in the soil until the occurrence of cool, moist weather in the fall.

As the fungus attacks a wide range of cultivated and wild hosts, these undoubtedly play a part in the perpetuation of the parasite. This is said to emphasize the need for control of Rhizoctonia, especially in restricted areas where susceptible crops must be grown in succession to the potato.

Manganese as a cure for a chlorosis of spinach, F. T. MCLEAN and B. E. GILBERT (*Science, 61 (1925), No. 1590, pp. 636, 637*).—The authors report the occurrence of chlorotic spinach plants grown on heavily limed soils during cool weather and high moisture conditions. The soil reaction is said to have ranged from pH 6.2 to 6.9.

In an attempt to correct the chlorotic condition without disturbing the soil reaction, yellow foliage plants were sprayed with dilute solutions of ferrous sulfate, manganous sulfate, ammonium nitrate, potassium sulfate, potassium phosphate, ferric ammonium citrate, citric acid, and manure leachings. Of these treatments, the only one which gave any positive or marked result was the manganous sulfate. Four days after treatment a definite improvement in the color of the leaves was observed, and at the end of a week the change had become very marked. Following these initial experiments, other spinach plants were treated with a solution of manganous sulfate at the rate of 8 parts per million, with the result of change in color and increased growth. When harvested, the yield from the treated plats showed an increase of 40 per cent.

The authors believe that the use of manganese salts for correcting chlorotic disturbances has not been previously reported. This treatment seems to offer an opportunity for field application under conditions similar to those described.

The mosaic disease of sugar cane in 1923: A discussion of the problems to date, J. R. Johnston (*[New York]: United Fruit Co., Agr. Research Dept., 1923, pp. 35, pl. 1*).—This paper is said to be based upon the editor's knowledge of the disease in the field in Cuba, Jamaica, Louisiana, Trinidad, and Surinam, and his personal observations of many of the experiments carried out by investigators named.

Sugar cane mosaic is fairly well spread over the sugar-producing parts of the earth. While a few canes (as Uba) appear to be immune and others (as Badilla and Java 36) appear to be resistant, most varieties are continuously attacked. Resistance varies with growing conditions (not yet clearly defined), but it has not been increased by artificial treatments. Without specific treatment diseased canes will seldom recover or survive. Opinion is almost unanimous that the disease can not be cured. The causal agent is unknown, but it is carried by the corn aphis, which has not yet been successfully controlled. Other plants in or near the infected fields carried the same disease. Roguing, with a sufficiency of healthy seed cane, may entirely eliminate the disease.

An extended bibliography is supplied.

A new bacterial disease of tomato fruits, N. A. Brown (*Science, 62 (1925), No. 1592, pp. 12, 13*).—A preliminary account is given of a bacterial disease of tomatoes that is said to have caused considerable losses to growers in Texas and Nebraska.

The disease is first noticed in full-grown green tomatoes when the fruits show small brown spots or a dark ring around and under the stem. As the fruit is shipped green, this condition may be readily overlooked. When the tomatoes have become a pink color, the disease has advanced and shows more plainly, the stem end at this time having become a dark brown. If broken through, the fruit shows a hard brown center. The rot accompanying the disease is usually down the center and may extend from the stem end to the blossom end.

Bacteria were found in great numbers in the tissues and successful inoculations were obtained by means of needle punctures. Infection is said to occur normally at the stem portion where the tough cuticle of the fruit ends, leaving a place where the bacteria can work into the more permeable tissue beneath the calyx.

The organism causing the disease is said to be a yellow, polar-flagellate species, the biology of which is still under consideration.

The inoculation of tomato and tobacco plants with potato mosaic virus, P. K. Olitsky and J. H. Northrop (*Science, 61 (1925), No. 1586, pp. 544, 545*).—The authors report having successfully infected tobacco plants by rubbing the leaves with mosaic-infected tubers, as well as with sprouts from diseased tubers. Experiments with tomatoes gave negative results, owing to the slow growth of the tomato plants.

It is concluded that the disease in potato plants can be transferred to tomatoes and tobacco from either the leaf or the tuber. The symptoms in tomato and tobacco are identical, whether the inoculum is derived from plants which showed very marked mosaic or from those which exhibited signs so slight as to be dubious, a fact which the authors state should be borne in mind in the selection of mosaic-free plants. The appearance of the experi-

mental disease is said to be identical with the natural affection in tomatoes and tobacco.

Cultivation of the virus of tobacco mosaic by the method of Olitsky, M. Mulvania (*Science, 62 (1925), No. 1593, p. 37*).—Following the method described by Olitsky (E. S. R., 53, p. 547), the author made a test of the infectiousness of various dilution cultures of mosaic from tomato plants when transferred to tobacco. Sterile distilled water was added as one of the culture media tested.

No evidence was obtained indicating an increase of the virus as the transfers proceeded. The water cultures gave a slightly higher rate of infection than those made in tomato extracts in the higher dilutions.

Foot-rot diseases of wheat in America, H. H. McKinney (*U. S. Dept. Agr. Bul. 1347 (1925), pp. 40, pls. 6, figs. 5*).—Data secured in cooperation with the Illinois, Kansas, North Carolina, Oregon, Washington, and Wisconsin Experiment Stations are given concerning the foot-rot diseases of wheat as they occur in this country, the term "foot rot" being applied to a number of diseases characterized by somewhat similar symptoms.

Descriptions are given of take-all of wheat caused by *Ophiobolus graminis*, foot rot due to *Helminthosporium sativum*, and an unidentified foot rot occurring in the Pacific Coast States, with which *Leptosphaeria herpotrichoides* and *Wojnowicia graminis* have been found, and of other foot rots that have been reported by various investigators. A foot rot which is said to have been severe in winter wheat fields in Oklahoma is described as caused by *H. tetramera* n. sp. In addition to the foregoing, foot rots may be caused by *Gibberella saubinetii*, *Sclerotium rhizodes*, and *O. herpotrichus*, the last-named not yet having been reported in America.

For the control of foot rots, several methods are recommended, what is considered the best being a combination of seed selection, seed treatment, rotation of crops, summer fallowing, and the prevention of the accumulation of infected straw, growth of wild grasses, etc.

Dry powder as wheat seed treatment [trans. title], P. Pouzin (*Jour. Agr. Prat., n. ser., 42 (1924), No. 40, pp. 272–274*).—A brief account of the use of powders in various countries as fungicidal seed treatment for cereals is brought up to the summer of 1924.

Crowngall in relation to nursery stock, A. J. Riker and G. W. Keitt (*Science, 62 (1925), No. 1599, pp. 184, 185*).—Recent studies of Riker (E. S. R., 50, p. 745) and of Robinson and Walkden (E. S. R., 52, p. 146) are said to minimize the potential importance of tumor strands and secondary tumors in relation to the occurrence of crown gall on apple nursery stock. These findings and others have led to a study of the crown gall problem, with special reference to its bearing on the fruit industry.

One of the lines of investigation undertaken was the differentiation of crown gall of apples from other abnormalities with which it may be confused, and a preliminary report on this phase of the study is given.

Malformations resembling certain types of crown gall and hairy root were found at the union of apple root grafts which were made from scions and stocks thoroughly disinfected and grown under sterile conditions. Cultural and microscopic examinations failed to show the presence of the crown gall organism in any of these overgrowths. Studies were made of a number of apple trees which were discarded at nurseries because of malformations at the union supposedly due to crown gall, and so far over 175 trees from 7 nurseries in 4 States have been examined without revealing the presence of the crown gall organism in any of the plants.

The authors believe the most satisfactory explanation is that the malformations dealt with on the rejected nursery trees were not induced by the crown gall organism, but they appeared to have been associated in their development with imperfect unions and subsequent disturbances in the translocation of water and food.

[Sphaeropsis malorum on apple in Italy] [trans. title], P. VOGLINO (*Nuovi Ann. [Italy] Min. Agr., 3 (1923), No. 1, pp. 38–48, figs. 6*).—A study is detailed of the several forms of injury to apple branches, leaves, and fruit due to *S. malorum*.

A rot of the Smyrna fig in California, P. D. CALDIS (*Science, 62 (1925), No. 1598, pp. 161, 162*).—A somewhat detailed account is given of studies of a soft rot of Calimyrna figs, which has been previously noted (E. S. R., 53, p. 448). The external symptoms of the rot are said to consist of a more or less extensive water-soaking of the skin accompanied by a bright pink or purple pigment. Such spots may occur principally around the eye or spread to the sides in indefinite areas. The pulp of the fruit under such spots is disintegrated, soft and watery, of a yellowish brown color, and in many cases of a very offensive putrid odor. The disintegration of the pulp may also take place without any external signs of the disease. Associated with this disease was a fungus which was tentatively identified as *Oospora verticillioides*, but which was subsequently identified by Sherbakoff as *Fusarium moniliforme*.

A study of the distribution of the disease showed that the fungus was spread throughout the fig-growing sections of California. It was also found that the disease is present only in the fruit of the Calimyrna variety, or other caprified figs. As previously noted, the fungus is carried principally by the caprifying insect, *Blastophaga psenes*.

An investigation of the flora of caprifigs and edible figs, both green and ripe, showed that the fruit of parthenocarpic varieties is sterile until the loosening of the scales and the opening of the eye. They will then remain sterile unless visited by insects. Fruit of caprified varieties is sterile previous to caprification, and fruit of caprifigs is sterile until caprified. A definite flora was persistently found in caprified edible figs and caprifigs, irrespective of the kind of crop.

The spores of the fungus were obtained from Blastophaga caught under sterile conditions as they were issuing from caprifigs.

A note on a rot of the Smyrna fig in California, N. A. BROWN (*Science, 62 (1925), No. 1604, p. 288*).—In a note referring to work of P. D. Caldis on a rot of the Calimyrna fig at the Califlornia Experiment Station, the author reports having isolated and grown the fungus for several months, and that it was identified by Sherbakoff as *Fusarium moniliforme*, which has been frequently confused with *Oospora verticillioides* when only the microconidial type of spores was found.

Fungus parasites of Japanese medlar [trans. title], J. B. MARCHIONATTO (*Rev. Facult. Agron. La Plata, 3. ser., 15 (1922), No. 1, pp. 69–72, pls. 3*).—The so-called Japanese medlar, or loquat (*Eriobotrya japonica*), is said to be subject to diseases of which two are described (after mention of an account of *Gloeosporium eriobotryae* noted by L. Hauman and L. R. Parodi [4]) in connection, respectively, with *Entomosporium mespili* and *Phyllosticta eriobotryae*. It is stated that destruction of diseased material should be supplemented by a winter wash of Bordeaux mixture or of 30 per cent iron sulfate.

The downy mildew of vines caused by Plasmopara viticola (*Egypt Min. Agr., Bot. Sect., Mycol. Div. Leaflet 1 (1923), pp. 3, pls. 3*).—Grape downy mildew (*P. viticola*) is said to be of frequent occurrence in Egypt, as else-

[4] Rev. Facult. Agron. y Vet. Buenos Aires, 3 (1921), No. 3, p. 256.

where, and to be controllable ordinarily by Bordeaux mixture or flowers of sulfur applied twice at intervals of about one month.

Diseases and pests of Hevea brasiliensis in Dutch East Indies, A. STEINMANN (*De Ziekten en Plagen van Hevea brasiliensis in Nederlandsch-Indië. Buitenzorg: Rubberproefsta. West-Java, 1925, pp. XIII+146+22, pls. 116*).—Systematic treatment is given of diseases of the root, trunk, branches, and leaves of *H. brasiliensis*. A section is devoted to abnormalities of different parts of the plant, and one to animal pests, and a comprehensive bibliography is appended.

Phytophthora faberi Maubl., C. H. GADD (*Ann. Roy. Bot. Gard. Peradeniya [Ceylon Jour. Sci., Sect. A], 9 (1924), No. 1, pp. 47–89, pl. 1, figs. 2*).—A comparative study of strains of Phytophthora isolated from cacao, papaw, Hevea, Dendrobium, Odontadenia, and breadfruit in Ceylon showed that spore dimensions are influenced by environmental conditions. This fact considerably diminishes the value, as systematic criteria, of spore measurements when strains are grown on different substrata or in different situations.

Oospores were found not in pure but in mixed cultures, with certain strains grown in combination. These strains are regarded as biological varieties of *P. faberi*. The presence of oospores in mixed cultures is explained on the assumption of heterothallism; the strains from cacao and papaw being regarded as + races, those from Hevea, Dendrobium, Odontadenia, and breadfruit as — races.

Inoculation experiments with Phytophthora faberi Maubl., C. H. GADD (*Ceylon Dept. Agr. Yearbook, 1925, pp. 15–17*).—From work mainly detailed in the account above noted, the author concludes that though a strain from one host plant may attack another host under laboratory conditions, it does not, in nature, readily do so, and that the virulence of any strain depends to a large extent on unknown external conditions.

ECONOMIC ZOOLOGY—ENTOMOLOGY

Influence of temperature and humidity upon the volatilization of nicotine from tobacco dust-lime hydrate mixtures, L. R. STREETER (*Jour. Econ. Ent., 18 (1925), No. 4, pp. 590–593*).—In this contribution from the New York State Experiment Station, it is pointed out that a little water added to the tobacco dust-lime hydrate mixture insures the more rapid evolution of the nicotine, the moisture being more important than temperature.

Utilization of the insecticide properties of derris [trans. title], F. WILLAUME (*Rev. Hist. Nat. Appl., 6 (1925), I, No. 9, pp. 285–288*).—A brief summary of information with references to the literature.

Injection of chemicals into trees, A. GORDON (*Calif. Countryman, 12 (1925), No. 2, pp. 9, 22, 23*).—During the course of investigations of the injection of chemicals into trees by a newly invented method, the author, working with Lipman, met with success in destroying the aphids on the leaves of certain trees within 24 hours by the use of a certain soluble compound.

Observations on insects developing immunity to insecticides, R. S. WOGLUM (*Jour. Econ. Ent., 18 (1925), No. 4, pp. 593–597*).—It is stated that the development of increased immunity to hydrocyanic acid gas by the red scale and black scale in certain districts of California (E. S. R., 44 p. 751; 48 p. 750), which have in the past relied upon fumigation for control, has become so pronounced that a single treatment even at a greatly increased dosage no longer can be depended upon to keep these pests in control.

Methods of control for two shade-tree pests, G. W. HERRICK (*Jour. Econ. Ent., 18 (1925), No. 4, pp. 630–632*).—The author finds the maple bladder gall (*Phyllocoptes quadripes*) to be readily susceptible to applications of lime sulfur,

and the spruce gall aphid (*Chermes abietis*) to applications of lime sulfur and oil emulsions. Experiments conducted over a period of three years have demonstrated the ease with which these pests may be controlled.

Important tree insects of Vermont, H. L. BAILEY (*Vt. Dept. Agr. Bul. 35 [1925], pp. 51, figs. 45*).—This is a summary of information on the more important insect enemies of trees in Vermont.

[Plant pests in the Philippines], A. HERNANDEZ (*Philippine Bur. Agr. Ann. Rpt., 23 (1923), pp. 149–159, pls. 2*).—This is a discussion of the plant pest control work of the year.

[Report on entomology], C. P. LOUNSBURY (*Union So. Africa Dept. Agr. Jour., 9 (1924), No. 6, pp. 556–567*).—This is a report of the work of the year of the division of entomology, particularly with locusts and with the European corn borer, which threatens to enter South Africa through the importation of broomcorn. It was found that living borers were present in importations both from Argentina and from Europe, the insect from Argentina being a Diatraea, identical or closely related to the sugar-cane borer.

Hints on the general treatment of insect pests in Mauritius, D. D'E. DE CHARMOY and A. MOUTIA (*Mauritius Dept. Agr., Gen. Ser. Bul. 31 (1925), Eng. ed., pp. 16, pl. 1*).—This is an account of methods of insect control, with the formulas of the more common insecticides and washes.

The termites (white ants) of China, with descriptions of six new species, S. F. LIGHT (*China Jour. Sci. and Arts, 2 (1924), Nos. 1, pp. 50–60; 2, pp. 140–142; 3, pp. 242–254; 4, pp. 354–358*).—In this paper the author discusses the status of the four species hitherto reported from China, exclusive of Taiwan (Formosa), gives descriptions of six species presumably new to science, and presents a preliminary artificial key for the identification of the species of Chinese termites known to date.

The thrips pest of tea in Darjeeling, E. A. ANDREWS (*India Tea Assoc., Sci. Dept. Quart. Jour., 1925, No. 2, pp. 60–105*).—The author here deals with two species of thrips which attack the young shoots of the tea bush, namely, the common thrips (*Physothrips setiventris*) and the black thrips (*Haplothrips tenuipennis*), and means for their control.

Three mirids predacious on the rose leaf-hopper on apple, J. R. STEAR (*Jour. Econ. Ent., 18 (1925), No. 4, pp. 633–636, fig. 1*).—Notes are given on the abundance, feeding habits, and probable importance of *Plagiognathus politus* Uhl., *Hyaliodes vitripennis* Say, and *Diaphnidia pellucida* Uhl. Descriptive notes and drawings are also included.

The occurrence of the beet leafhopper, Eutettix tenella Baker, in the eastern United States, D. M. DELONG (*Jour. Econ. Ent., 18 (1925), No. 4, pp. 637, 638*).—The author records the collection of the beet leafhopper on sea purslane at Miami, Fla., and remarks upon the possibility of its becoming a pest on the sugar beet in Ohio and adjoining States.

Susceptibility to dust and spray mixtures of the pear psylla (Psylla pyricola Förster), F. Z. HARTZELL (*New York State Sta. Bul. 527 (1925), pp. 5–123, pls. 12, figs. 10*).—This is a report of investigations conducted from 1920 to 1923 on the Ontario Plain in Niagara, Orleans, and Monroe Counties, N. Y., with recommendations and suggestions for control to apply specifically to that region. Three distinct methods of control were investigated, including (1) the egg spray, (2) nymphal sprays, and (3) dusting when the insects were in the hard-shell nymph and adult stages.

It was proved that failure to control pear psylla by means of an egg spray, providing lime sulfur 1–8 is thoroughly applied, is due entirely to oviposition continuing beyond the time the cluster buds have separated. However, in lo-

calities where prolonged egg deposition does not occur the egg spray is a very efficient method of control. It was found that nicotine sulfate used at the rate of 1 pint in 100 gal. of water is the most efficient spray for pear psylla nymphs, but that fungicides that are safer for pear foliage must be substituted for lime sulfur. In comparison with nicotine dusts, the nicotine sprays gave higher efficiency, and the average grower was successful with sprays more frequently than with dusts. One per cent nicotine dust controlled the adults practically as well as mixtures containing larger amounts of the poison, but failed to kill the nymphs. Nicotine dust containing organic materials failed to control even the adults. Dusts containing 2 per cent free nicotine appeared to be slightly more toxic than those containing nicotine sulfate in equal amount, but more experiments are needed to prove this point. A treatment for the adults alone, using reduced amounts and repeating the application after the nymphs have changed to adults, was about as successful as the regular form of application, but the labor involved was greater.

In the experiments dusting was found to cost from 1.4 to 2.8 times as much as spraying when labor and materials are considered, the difference being due to the cost of home-mixed and ready-mixed materials, but dusting was nearly 1.5 times as rapid as spraying. Nymphal sprays are recommended for regions where the egg spray is ineffective, or where the latter has been omitted. Dusting is recommended to supplement spraying in large commercial orchards where time is an important factor.

Investigations on the control of pear psylla, F. G. MUNDINGER (*New York State Sta. Bul. 529 (1925), pp. 3–36, fig. 1*).—This bulletin presents data obtained from scheduled treatments with various dust and spray materials for the control of the pear psylla in an orchard in the vicinity of Geneva during the season of 1924. None of the dusts applied appeared to control the species in the egg or early nymphal stages. Lime sulfur spray (1–8) killed many eggs. The weak Bordeaux sprays and the dry-mix sprays containing nicotine sulfate were very effective against the nymphs. Tobacco dust appeared to be a factor of effectiveness when added to the various sprays in combating the nymphs. Little injury was caused by any of the materials except lime-sulfur sprays and some of the oil applications.

"Calcium cyanide dusts grades 'A' and 'B' and nicotine dusts, under favorable conditions, proved very toxic to the adults. 'A' and 'B' grades of calcium cyanide dusts averaged greater reductions in tree population and smaller percentages of revival than did a homemade lime-nicotine dust containing 2 per cent nicotine or a commercial mixture containing 2.7 per cent nicotine. The best results with dusting were obtained on calm days when the temperature was relatively high. A dosage of 2 lbs. of 'B' grade calcium cyanide, a minimum of 1.5 lbs. of 'A' grade calcium cyanide, or 2 lbs. of lime-nicotine dust (2 per cent) per average-sized tree is advisable for best results. None of the above dusts, where carefully applied, caused noticeable injury to mature foliage. 'A' grade calcium cyanide dust caused some blackening of young, tender leaves when used early in the season."

Identity of the mealybug described as Dactylopius calceolariae Maskell, H. MORRISON (*Jour. Agr. Research [U. S.], 31 (1925), No. 5, pp. 485–500, figs. 6*).—The increasing importance of the elongate gray mealybug found in many parts of the world on sugar cane led the author to conduct the study here reported. He finds that, as a result of misidentifications, the name *calceolariae* has been used in literature to designate several species of mealybugs, but that properly its use must be restricted to specimens described from the native plant Traversia, at Christchurch, New Zealand, in 1879. The name *Trionymus danthoniae* n. sp. should be applied to specimens from Danthonia

from New Zealand previously identified as *calceolariae;* the name *T. diminutus* (Leon.) to specimens from *Phormium tenax* from several localities throughout the world, previously identified as *calceolariae;* and the name *Pseudococcus boninsis* (Kuw.) to specimens of an elongate gray mealybug already known to occur on sugar cane in many parts of the world and previously identified as *calceolariae*. It is found that some references in literature to the species *P. saccharifolii* (Grn.) and *T. sacchari* (Ckll.), both of which appear to be distinct and valid species, actually refer to *P. boninsis*. The variety *minor* (Mask.) of the species *calceolariae* is found to be identical with *P. citri* (Risso). Under the name *T. danthoniae*, a species from New Zealand, the host of which is unknown, is described as new. Detailed descriptions of the species involved under the name *calceolariae* are included, and a key is given for their separation.

The internal anatomy of the clover root mealy-bug, Trionymus trifolii Forbes (Homoptera, Coccidae), W. S. Hough (*Bul. Ent. Research, 16 (1925), No. 1, pp. 25–29, figs. 6*).—This contribution from the Virginia Experiment Station presents the more important features of the internal anatomy of a subterranean viviparous mealybug, commonly found on the roots of clover in the eastern part of the United States.

The transfer of tobacco and tomato mosaic disease by the Pseudococcus citri, P. K. Olitsky (*Science, 62 (1925), No. 1611, p. 442*).—The author reports the discovery that *P. citri* is a vector in the greenhouse of the mosaic disease of tobacco and tomato.

The life cycle of Macrosiphum solanifolii with special reference to the genetics of color, A. F. Shull (*Amer. Nat., 59 (1925), No. 663, pp. 289–310*).—The author reports upon the potato aphid, which exists in two color varieties, green and pink. Its color is due to globules of different colors and sizes contained in the body fluid. The several forms belonging to both of these varieties are briefly described.

The factors of inheritance and parentage as affecting the ratio of alate to apterous individuals in aphids, H. E. Ewing (*Amer. Nat., 59 (1925), No. 663, pp. 311–326, fig. 1*).—This is a contribution from the U. S. D. A. Bureau of Entomology.

Natural enemies of the pea aphid (Illinoia pisi Kalt.), their abundance and distribution in Wisconsin, C. L. Fluke, Jr. (*Jour. Econ. Ent., 18 (1925), No. 4, pp. 612–616*).—The author presents a list of 38 different enemies found attacking the pea aphid in Wisconsin.

Dispersal of butterflies and other insects, E. P. Felt (*Nature (London), 116 (1925), No. 2914, pp. 365–368*).—This account relates particularly to the migratory distribution of insects by means of flight.

On grasserie of the silkworm [trans. title], Paillot (*Compt. Rend. Acad. Sci. [Paris], 181 (1925), No. 8, pp. 306–308*).—The author points out that, while there is no sure method of effectively combating the parasite of grasserie, certain measures can be taken which will reduce the danger of infection to a minimum.

Instructions on silk-worm rearing, C. C. Ghosh (*Burma Dept. Agr. Bul. 21 (1924), pp. [3]+21, pls. 11*).—This is a practical account.

The pink bollworm in Australia, E. Ballard (*Jour. Econ. Ent., 18 (1925), No. 4, pp. 641, 642*).—The occurrence in Queensland of two distinct races of the pink boll worm, the Hibiscus and the cotton race, is recorded, the former differing from the cotton race only in that it is more deeply colored and the color evenly distributed. It is said to be established in species of wild Hibiscus apparently all over Queensland and is not found in cotton. The cotton

race is confined to a line in Queensland a little south of parallel 26 and stretches in places up to 150 miles inland.

Observations on the cutworm Euxoa auxiliaris Grote and its principal parasites, S. J. Snow (*Jour. Econ. Ent., 18 (1925), No. 4, pp. 602–609*).—This is an account of an outbreak of *E. auxiliaris* in Utah in 1916 which is thought to have been controlled by parasites, of which about a dozen species were reared.

Notes on a caterpillar pest of dadap (Taragama dorsalis Wlk.), J. C. Hutson (*Trop. Agr. [Ceylon], 65 (1925), No. 1, pp. 27–32, pls. 5*).—A report of studies of this lepidopteran, which, in 1924, attacked an area of dadaps shading 100 acres of cacao on an estate in the Kandy district. About 25 acres of dadaps were completely stripped, and the cacao was partially defoliated.

Parasitism of the strawberry leaf-roller Ancylis comptana Frohl., H. C. Lewis (*Jour. Econ. Ent., 18 (1925), No. 4, pp. 609–612*).—In a study of the parasites of this leaf roller under normal infestations, six species of hymenopterous parasites, three more probable parasites, and one tachinid fly were found attacking it. Observations indicate that, during the season of 1924 in Ohio, these natural enemies maintained a sufficient check on the leaf roller to prevent serious injury.

The red-banded leaf-roller, S. W. Frost (*Pennsylvania Sta. Bul. 197 (1925), pp. 3–27, figs. 19*).—This is a report of investigations of *Eulia velutinana* Wlk., brief accounts of which insect by the author have been noted (E. S. R., 44, p. 656; 47, p. 161; 48, p. 54; 53, p. 558). The work deals largely with studies of the life history and habits of the insect, the details being presented in tabular form. It is pointed out that the red-banded leaf roller is quite generally distributed throughout the United States, but is more injurious in Pennsylvania and States farther south.

The larvae eat shallow cavities in the sides of the apple, which seldom penetrate very deep but which materially mar the quality of the fruit. The seasonal life history varies considerably from year to year, but always keeps pace with the development of the season. Three complete generations have been reared in Pennsylvania in a season. The eggs of the first generation are laid on the limbs and larger branches of apple trees. Those of later generations are laid on the foliage of apple or other hosts. The larvae of the first and second generations feed mostly on succulent foliage, occasionally attacking the fruit. Those of the third generation feed chiefly on the fruit.

One species of Diptera and 13 species of Hymenoptera were reared from the pupae of this insect. Arsenate of lead applied at the time of the pink application, at the end of June or early in July, and at the end of August or beginning of September, will poison the young larvae of the first, second, and third generations, respectively, and prevent their injury to the foliage and fruit.

The present status of the European corn borer in Michigan, R. H. Pettit (*Michigan Sta. Circ. 70 (1925), pp. 3–14, figs. 12*).—This is a practical summary of information on the European corn borer in Michigan.

The European corn borer and the latest methods of control, L. Caesar (*Ontario Dept. Agr. Circ. 47 (1925), pp. 8, figs. 4*).—This is a practical summary of information.

A contribution to the study of insect parasites of the eudemis moth, Polychrosis botrana Schiff., and the grapevine pyralid, Oenophthira pilleriana Schiff. [trans. title], P. Voukassovitch (*Min. Agr. [France], Ann. Épiphyties, 11 (1925), No. 2, pp. 107–120*).—The observations show that the parasitism of these grape pests is very irregular, varying with the locality and season.

A contribution to the study of an entomogenous fungus, Spicaria farinosa (Fries) var. verticilloides Fron. [trans. title], P. VOUKASSOVITCH (*Min. Agr. [France], Ann. Épiphyties, 11 (1925), No. 2, pp. 73–106, figs. 2*).—A report of extended studies of this fungus parasite of the larvae of the cochylis and of the larvae and pupae of the eudemis moths. The mortality caused in eudemis pupae was 76 per cent in certain parts of the vineyard observed in the winter of 1921–22 and 24 per cent in the whole of the same vineyard in the winter of 1922–23.

Water hyacinth and the breeding of Anopheles, M. A. BARBER and T. B. HAYNE (*Pub. Health Rpts. [U. S.], 40 (1925), No. 47, pp. 2557–2562*).—The authors find there may be considerable production of Anopheles in water-hyacinth-covered waters, as the weed interferes with wave action and the activities of minnows and hinders the use of larvicides and other antimosquito measures. High production of Anopheles in water hyacinth is not universal, however, and measures against the weed should be undertaken only where there is a considerable production of Anopheles and a significant amount of malaria.

The mosquitoes of Panama, H. G. DYAR (*Insecutor Inscitiae Menstruus, 11 (1923), No. 10–12, pp. 167–186; 13 (1925), No. 7–9, pp. 101–195*).—In the first paper, the author lists 128 species as occurring in Panama, omitting the names of those forms which are doubtfully the sexes of others, the list being corrected to the year 1922. In the second paper are added synoptic tables to genera and species of adult and larva and male hypopygium within the genus. In addition to 131 forms here recorded, the author includes 20 species not yet recorded, but which seem liable to occur.

The mosquitoes of Egypt, T. W. KIRKPATRICK (*Cairo: Egypt Anti-Malaria Comn., 1925, pp. XIII+224, pls. 36*).—This is a monographic account of the mosquitoes of Egypt, presented in six parts.

In part 1 (pp. 1–8) the author presents a short account of the previous history of the study of mosquitoes in Egypt, a list of the species now recorded from Egypt, and a list of species which may possibly be found to occur in Egypt, considers the extent of the present survey, and describes the methods employed for collecting mosquito larvae and the examination of the samples of larvae and the breeding technique employed. Part 2 (pp. 9–40) consists of an introduction to the systematics of mosquitoes, part 3 (pp. 41–136) of a systematic account of Egyptian mosquitoes, and part 4 (pp. 137–155) of an introduction to the ecology and biology of mosquitoes; part 5 (pp. 156–168) deals with the country of Egypt, and part 6 (pp.169–195) with the distribution, seasonal prevalence, ecology, and biology of the species of mosquitoes occurring in Egypt. Following the conclusions (pp. 195–203), notes are presented in an addenda (pp. 205, 206) on the mosquitoes occuring in the oasis of Baharia and on the mosquitoes from central Sinai. A table showing the distribution of mosquitoes in Egypt and an index are also included.

Bats, mosquitoes, and dollars, C. A. R. CAMPBELL (*Boston: Stratford Co., 1925, pp. X+262, pls. 41*).—This is an extended discussion of bats and their food habits, particularly as related to mosquitoes and their eradication through the encouragement of bats by the erection of bat roosts, etc.

A study of the top minnow, Gambusia holbrooki, in its relation to mosquito control, S. F. HILDEBRAND (*U. S. Pub. Health Serv., Pub. Health Bul. 153 (1925), pp. VI+136, pls. 7, figs. 54*).—An extended report of investigations of this enemy of mosquitoes.

Dipterous enemies of domestic animals [trans. title], A. KOEGEL (*Landw. Hefte, No. 51–52 (1925), pp. 52, figs. 13*).—This is a summary of information

on the more important dipterous parasites of livestock and measures applicable in their combat.

A tentative arrangement of the muscoid flies based on the puparia, C. T. Greene (*Ent. Soc. Wash. Proc., 27 (1925), No. 8, pp. 157–163, fig. 1*).—This is a tentative grouping of the muscoid flies, which correlates characters of the puparium with those of the adult, and is based on a study of about 400 species representing the families Tachinidae, Dexiidae, Sarcophagidae, Oestridae, Calliphoridae, and Muscidae (including the Anthomyiidae). The principal adult character used is the arista of the antenna, whereas that of the puparium is the posterior spiracular plate.

The natural control of the leaf-miner Phytomyza aconiti Hendel (Diptera) by Tachydromia minuta Meigen (Diptera), F. G. S. Whitfield (*Bul. Ent Research, 16 (1925), No. 1, pp. 95–97, figs. 3*).—A report of observations of an empid which is one of the few British Diptera other than asilid that are entirely predacious.

A study of control measures for the olive fly (Dacus oleae) in Portugal [trans. title], A. F. de Seabra (*Bul. Matières Grasses Inst. Colon. Marseille, No. 4 (1925), pp. 93–100; trans. in Internatl. Rev. Sci. and Pract. Agr.* [*Rome*], *n. ser., 3 (1925), No. 1, pp. 269–276*).—This is a report upon the work being conducted in Portugal. A list is given of the formulas of poison baits.

The cherry black fly (Myzus cerasi), F. M. Wimshurst (*Bul. Ent. Research, 16 (1925), No. 1, pp. 85–94, figs. 6*).—The author gives a systematic description of the forms of the black cherry aphid observed, and an account of the life history so far as it has been traced by him during two years' observation in Kent, England.

A practical control for the pomace fly, R. M. DeCoursey (*Jour. Econ. Ent., 18 (1925), No. 4, pp. 626–629, fig. 1*).—A simple trap baited with fermented banana has been devised, which, under practical conditions, will furnish an adequate means of control, especially for indoor infestations.

The arthropod enemies of mollusks, with description of a new dipterous parasite from Brazil, J. Bequaert (*Jour. Parasitol., 11 (1925), No. 4, pp. 201–212, fig. 1*).—Under the name *Malacophagula neotropica* n. sp. the author describes a sarcophagid reared from the snail *Bulimulus tenuissimus* (d'Orb.) in Brazil.

A comparative study of the history of certain phytophagous scarabaeid beetles, W. P. Hayes (*Kansas Sta. Tech. Bul. 16 (1925), pp. 3–133, pls. 10, fig. 1*).—This is a report of studies in which a comparison was made of the life cycles of certain species of the subfamilies Melolonthinae, Rutelinae, Dynastinae, and Cetoniinae of the family Scarabaeidae. In all, 16 species are considered, and the life cycles as observed at Manhattan, Kans., are compared with the known life cycles of other members of the family. Each of the species, in so far as possible, has been considered in relation to its distribution, relative abundance at Manhattan, the attraction to lights, period of flight, food habits both in the adult and larval stages, the proportion of sexes, mating, oviposition, and the length of the various stages. Data on the various stages are condensed into tables, in which the maximum, minimum, and average periods of development are stressed.

In the Melolonthinae, 17 of the 25 species of Phyllophaga occurring at Manhattan have been reared. The data on 7 of these have been published elsewhere (E. S. R., 43, p. 760), and the remaining 10 are discussed herein. Most of the species were found to have both a 2-year and a 3-year life cycle when reared under artificial conditions. Systematic collections from 1916 to 1922 indicate that the normal period is 3 years. Two species, *P. affabilis* Horn and *P. longitarsa* Say apparently develop in 1 year, while *P. tristis* Fab. may require 1 or 2 years to complete growth.

Three species of the Rutelinae, *Anomala innubia* Fab. representing the tribe Anomalini and *Pelidnota punctata* L. and *Cotalpa lanigera* L. representing the tribe Rutelini were under observation. It is apparent that the Anomalini have a 1-year cycle as observed for *A. innubia*. In previous papers the author has shown that *A. binotata* Gyll. (E. S. R., 38, p. 863) and *Strigoderma arboricola* Fab. (E. S. R., 46, p. 252) have 1-year periods of growth, and the Japanese beetle (*Popillia japonica* Newm.) is known to have a corresponding life history. In the tribe Rutelini a longer period of growth is required. *C. lanigera* requires 2 and often 3 years, and *P. punctata* develops in 2 years.

In the literature there are several life histories of the Dynastinae reported, all of which have an approximate 1-year life cycle. Herein it is shown that *Ligyrodes relictus* Say falls in the same category. The beetles appear in the spring, lay eggs, and the resulting larvae complete their growth by fall and the beetles hibernate. The author has shown elsewhere that two other dynastinids, *Ligyrus gibbosus* DeG. (E. S. R., 37, p. 567) and *Ochrosidia immaculata* Burm., reported under the name *Cyclocephala villosa* (E. S. R., 38, p. 863), develop in 1 year. Others of the subfamily known to require the same or approximately the same time are *Strategus titanus* Fab., *S. quadrifovatus* Beauv., *Dyscinetus trachypygus*, *D. barbatus*, and *Euetheola rugiceps*. The subfamily Cetoniinae, in two cases here discussed, were observed to develop in 1 year, *Euphoria fulgida* Fab. being shown to have a slightly different life history from that of *E. sepulchralis* Fab., but requiring approximately the same period. In the literature it is found that *E. inda* L. and *Cotinis nitida* L. (E. S. R., 47, p. 854) likewise have a 1-year period of growth.

"A general comparison of the four subfamilies shows that the life cycle in the Melolonthinae is highly variable and may require 1, 2, 3, and probably, in northern latitutdes, 4 years to complete growth. The Rutelinae in one tribe, Anomalini, need only 1 year, while the other tribe, Rutelini, must have at least 2 and sometimes 3 years to mature. In the Dynastinae and the Cetoniinae the life cycle requires but 1 year."

Coutrol of Japanese beetle in lawns, B. R. Leach (*Penn. Dept. Agr. Bul. 410 (1925), pp. 12, figs. 7*).—Directions are given for the prevention of injury to lawns or golf greens by this pest through the use of emulsified carbon disulfide diluted with water.

Status of the Japanese beetle in 1924, L. B. Smith (*Jour. Econ Ent., 18 (1925), No. 4, pp. 616–620*).—A summary of information on the occurrence of this pest in 1924.

The hispid leaf-miner (Coelaenomenodera elaeidis Maul.) of oil palms (Elaeis guineensis Jacq.) on the Gold Coast, G. S. Cotterell (*Bul. Ent. Research, 16 (1925), No. 1, pp. 77–83, figs. 5*).—This is a report of studies of a beetle leaf miner enemy of oil palms in the Gold Coast which is so highly parasitized that it is unlikely that it will ever become a serious pest. Under ordinary conditions parasitism probably reaches as much as 90 per cent, from 50 to 60 per cent being parasitized in the egg stage.

The Colorado potato beetle in France [trans. title], J. Feytaud, G. Lafforgue, E. Rabaté, et al. (*Min. Agr. [France], Ann. Off. Agr. Region. Sud-Ouest, Nos. 2 (1923), pp. 69, pl. 1, figs. 13; 4 (1924), pp. 81, pls. 2*).—The second fascicle gives an account of the Colorado potato beetle, its occurrence in France, where it was first discovered on June 15, 1922, in the Canton of Blanquefort, and control work. The fourth fascicle deals with its occurrence in France during the year 1923 (E. S. R., 53, p. 159).

Bark-beetle epidemics and rainfall deficiency, F. C. Craighead (*Jour. Econ. Ent., 18 (1925), No. 4, pp. 577–586*).—That there is an apparent correlation between deficiency of rainfall and the abundance of the southern pine

beetle in destructive numbers is pointed out. Heavy precipitation while the young broods are developing under the bark produces a very heavy and effective mortality.

The factors determining the distribution of North American bark-beetles, J. M. Swaine (*Canad. Ent., 57 (1925), No. 11, pp. 261–266*).—A contribution from the division of forest insects, Entomological Branch, Department of Agriculture, Ottawa.

The sweet potato weevil (Cylas formicarius Fabr.), S. S. Gonzales (*Philippine Agr., 14 (1925), No. 5, pp. 257–281, pls. 3*).—This is a report of studies of the sweet-potato weevil in the Philippines, where enormous losses in sweet potato fields often result from its attack.

Practical field control of the common bean weevil, Bruchus obtectus Say, A. O. Larson and C. K. Fisher (*Jour. Econ. Ent., 18 (1925), No. 4, pp. 620–625*).—This is a report of results obtained in investigations in the control of the bean weevil commercially in the field in the Chino district in southern California. The indications are that the amount of infestation at harvest is proportional to the number of weevils that have been liberated within flying distance of the fields during the time the beans have been ripening, and that complete cooperation in preventing their breeding in dry beans during the summer would eliminate the weevils from the growing crop.

A new parasite of the alfalfa weevil, T. R. Chamberlin (*Jour. Econ. Ent., 18 (1925), No. 4, pp. 597–602*).—This paper discusses features in the life history of the eulophid parasite *Tetrastichus incertus* (Ratz.) as disclosed by the study of alfalfa weevil material from various parts of Europe. It has been found to occur over a rather wide range of territory in Europe, and at times parasitizes a high percentage of the alfalfa weevil larvae. It has been found to be normally a primary parasite of the weevil, and the indications are that it is rarely, if ever, secondary upon any of the known parasites of the weevil.

Report of the First National Congress of Commercial Apiculture, edited by E. Poher (*1. Congrès National d'Apiculture Commerciale, Paris, 1924. Mémoires et Comptes-Rendus. Paris: Compagnie d'Orléans, 1925, pp. 146, figs. 37*).—Memoirs and proceedings of meetings held at Paris on May 5 and 6 are reported.

Honey flora of Victoria, F. R. Beuhne (*Melbourne: Victoria Dept. Agr., [1925], 2. ed., rev., pp. 148, figs. 70*).—This is a descriptive account of plants important to apiculture in Victoria.

Strain of immune bees, B. Lineburg (*Gleanings Bee Cult., 53 (1925), No. 11, pp. 709, 710*).—The author records the discovery of colonies which are apparently immune to American foulbrood.

Marking honeybees for behavior studies, R. L. Parker (*Jour. Econ. Ent., 18 (1925), No. 4, pp. 587–590*).—The author finds the most satisfactory method of marking bees to be through the use of 1 part of dry pigment mixed with 1 part of liquid white shellac and diluted to the right consistency with ethyl alcohol.

Wasps (*[Gt. Brit.] Min. Agr. and Fisheries, Misc. Pub. 44 (1924), pp. 8, pls. 2*).—This is a practical account of wasps, including a colored plate which illustrates the adults of seven species.

Two new Canadian Ichneumonoidea, H. L. Viereck (*Canad. Ent., 57 (1925), No. 11, p. 278*).—Under the name *Campoplex (Eulimneria) bakeri* n. sp. the author describes a parasite reared from pupae of the Iris pod borer at St. Anne, Que., and under the name *Opius (Chilotrichia) hyoscyamiellus* n. sp. a parasite from *Pegomyia hyoscyami* Panz., at the same place.

Cercaria gunnisoni, a new Xiphidiocercaria from Colorado, C. T. Hurst (*West. State Col. Colo. Bul., 12 (1923), No. 9, pp. 15, pl. 1*).—Under the name

C. gunnisoni, the author describes a small distome cercaria which was found in the snails *Lymnaea stagnalis appressa* Say and *L. proxima* Lea., from the Gunnison watershed of western Colorado. It is unknown beyond the three stages described by the author.

ANIMAL PRODUCTION

An improved method of computation of net-energy values of feeding stuffs, M. KRISS (*Jour. Agr. Research* [*U. S.*], *31* (*1925*), *No. 5, pp. 469–484*).—The method of calculating the net energy values of feeds in the early experiments of Armsby and Fries (E. S. R., 25, p. 872), based on a comparison of the gains in energy yielded by different amounts of a feed, was found to be subject to error when the metabolizable energy of a unit amount of feed varied in the comparative test periods. The method for computing the net energy value used in the later experiments by these authors (E. S. R., 40, p. 365) depended on averaging several values obtained for varying amounts of feed in the different periods. It is shown that this tended to obscure the individuality of the data and to exaggerate the effects of the necessary assumptions.

A new method for computing the net energy values of feeds is suggested which tends to eliminate the exaggeration of errors and makes possible the computation of the net energy value of a feed for each test period. The new method depends on separate determination of the net energy required for maintenance, the gain of energy by the animal, and the heat increment value of the feed. The heat increment is the difference between the heat production in two periods divided by the difference in quantity of dry matter consumed in the two periods. The average is used in cases where more than one value is obtained. The maintenance requirement of net energy is determined as the average for the separate periods of the differences between the computed heat increment of the feed consumed and the heat production. The net energy gained by the animal is the difference between the metabolizable energy of the ration and the total heat production. The total net energy of the ration is the sum of the net energy of maintenance and gain. From this the net energy per kilogram of dry matter and the percentage utilization of the metabolizable energy are calculated. Examples are given for comparison of the results of calculations, made by the later method of Armsby and Fries and by the new method, of the net energy of hominy chop, mixed hay, alfalfa hay, alfalfa meal, and red clover hay, and it is shown that the new method appears to give more accurate and uniform results and furnishes an improved basis for the judgment of the consistency of an experiment as a whole, due to the individual figures obtained.

Composition and cost of commercial feeding stuffs in 1924, A. W. CLARK ET AL. (*New York State Sta. Bul. 530* (*1925*), *pp. 3–36*).—A summary of the average analyses and general nature of the different classes of feeds inspected in New York State for 1925 is given, based on the chemical analyses noted (E. S. R., 54, p. 264), together with a brief summary of results for 1924.

Analysis of daily activity of the albino rat, J. R. SLONAKER (*Amer. Jour. Physiol.*, *73* (*1925*), *No. 2, pp. 485–503, figs. 14*).—The hourly distribution over 24-hour periods of the voluntary activity of 38 albino rats as determined in revolving cages (E. S. R., 53, p. 428) is reported for the different stages of the oestrous cycle and during pregnancy and pseudopregnancy. By far the greater part of the voluntary activity occurred at night between 8 p. m. and 10 a. m., but the normal activity was somewhat curbed by the necessity of having electric lights for recording the activity hourly. Most animals began their

nightly activity between 8 and 11 p. m. The average time of running was very similar during oestrum and dioestrum, 13.15 and 13.0 hours, respectively, but the rate was much more rapid during oestrum as the run averaged 10,420 revolutions compared with an average of 5,136 revolutions during the dioestrous period. The activity on the days prior to and following oestrum was also greater than during dioestrum. Comparative studies showed that the percentage of time during which inactivity occurred was 58 in young virgins, 62 in old virgins, 48 in nonpregnant multiparous females, 27 in multiparous females in early pregnancy, 67 in multiparous females in late pregnancy, and 64 per cent in pseudopregnant females. Age, parturition, gestation, and pseudopregnancy seemed to have characteristic influences on the activity.

The influence of the composition of the ration on the digestibility of crude fiber [trans. title], F. Honcamp, E. Kochs, E. Müller, and W. Schramm (*Landw. Vers. Sta., 103 (1925), No. 3-4, pp. 179-208*).—The effects of additions to the rations of high protein supplements and fermented feeds, and of different methods of feeding, on the digestibility of the crude fiber of the roughage have been investigated in digestion experiments with wethers.

In the first experiment, 2 wethers were fed during three digestion periods and 1 wether during a fourth period of 10 days each. During the first period the basal ration only was fed, consisting of 700 gm. of clover hay per head daily. In the succeeding periods, 100, 200, and 300 gm. of gluten were added to the basal ration. The results showed very close agreement for the digestibility of the different nutrients of the rations by 2 wethers, and showed no significant variations in the digestibility as influenced by the additions of the protein supplement, except in the case of the fat, which averaged in successive periods 68.5, 50.5, 46.6, and 37.3 per cent. The fiber was uniformly digested throughout, the coefficients of digestibility averaging 57.3, 55.3, 56, and 55.8 per cent, respectively, in the four periods. These results appeared to contradict earlier conclusions of N. Zuntz in which he found that additions of protein-rich feeds to the rations tended to increase fermentation in the alimentary tract, by which process larger amounts of crude fiber became soluble and the digestibility was increased.

In the second experiment, 4 wethers were used during two digestion periods. The average daily basal ration in each digestion experiment consisted of 150 gm. of ground corn, 150 gm. of ground rye, 200 gm. of peanut meal, 125 gm. of meadow hay, and 125 gm. of dry straw to which was added 1,000 gm. of fresh potatoes in the first trial and 1,000 gm. of fresh beets in the second trial. Two of the animals received portions of all the ingredients of the ration at both the morning and afternoon feeding, while the other 2 received only the peanut meal and roughage (meadow hay and rye straw) in the morning and the carbohydrate feeds (corn, rye, and beets or potatoes) in the evening. The average figures for the 2 animals in the potato feeding period, receiving the roughage and carbohydrate feeds separately, showed a greater digestibility for the fat and crude fiber than the animals receiving the entire ration mixed. The average digestion coefficients for fat were 87.0 and 83.8 and for fiber 55.5 and 48.3 per cent. In the period when the beets were fed, all nutrients except fat, which was practically the same, showed a greater digestibility by the animals receiving the portions of the entire mixed ration than by animals fed roughage and protein feeds in the morning and carbohydrate feeds in the evening.

These somewhat inconclusive results led to a repetition of this experiment with 3 wethers. The basal ration consisted of 400 gm. of meadow hay, 100 gm. of ground corn, 100 gm. of ground barley, 100 gm. of potato flakes, and 100 gm. of casein, with the addition of 1,000 gm. of fresh rape in the first

period and 1,200 gm. of fresh potatoes in the second period. One animal received the hay and the casein only in the afternoon and the rest of the feed in the morning. The results in the second period with this animal are only for 5 days. The other 2 animals used in the experiments received the portions of the total ration mixed and fed twice daily in both periods.

The nutrients in the rations were all digested slightly better during the rape feeding period when the different portions of the ration were fed separately, but in the second period when potatoes were included in the ration, the digestion of fat was much reduced, 16.2 per cent, though the crude fiber digestibility was increased 2.4 per cent. The authors conclude from these two experiments that the feeding of the roughage and protein feeds separate from the carbohydrate feeds tends to increase the digestibility of the entire ration, but that this increase is too slight to be of any practical value.

In another experiment, the effect of fermented beets and beet tops on the digestibility was investigated. The basal ration fed to 4 wethers during two periods consisted of 1,000 gm. of fresh potatoes, 125 gm. of rye straw, and 125 gm. of meadow hay. The beets were fed separate to 2 of the animals and mixed for the other 2 as in the preceding experiments. One thousand gm. of fermented beets sliced and 200 gm. of peanut meal were included in the ration during the first period, and 1,000 gm. of fermented beet tops and 200 gm. of sesame cake supplemented the basal ration during the second period.

The digestibility of the crude fiber by the animals fed on mixed rations and separate rations showed the greatest differences of any of the nutrients. The fiber was digested better in the mixed ration. The authors believe that the modifications of the rations which have been tested have had practically no important influence on the digestibility of the ration.

Cattle feeding investigations, 1923–24, C. W. McCampbell, B. M. Anderson, and H. W. Marston (*Kansas Sta. Circ. 117 (1925), pp. 11, figs. 2*).—Previously noted (E. S. R., 52, p. 671).

A biometric study of length of metabolism experiments with cattle, R. W. Swift (*Jour. Dairy Sci., 8 (1925), No. 3, pp. 270–281, figs. 4*).—A statistical study is reported of the accuracy of the daily weights of the fresh feces produced by 1,008 cows receiving a uniform amount of feed in the metabolism experiments at the Ohio Experiment Station (E. S. R., 47, p. 873) and by 960 steers in experiments at the Pennsylvania Experiment Station and the Institute of Animal Nutrition (E. S. R., 10, p. 1079; 15, p. 799; 19, p. 866; 25, p. 872). The cows in the experiments were receiving supermaintenance rations, while the food intake of the steers was close to maintenance. The data were tabulated in each case for experiments lasting 8, 12, 16, 20, and 24 days. The individual feces weights for each period length were corrected to the average for all cows or steers. The results showed, after calculating the usual constants, that with odds of 31 to 1 the errors of the average of the periods of 8, 12, 16, 20, and 24 days would not be greater than 5.54, 4.36, 3.35, 2.89, and 2.11 per cent, respectively, for the cows and 7.26, 6.08, 5.25, 4.58, and 3.90 per cent, respectively, for the steers.

The development of East Prussian Black and White Inland cattle from birth to the conclusion of growth [trans. title], P. Hansen (*Arb. Deut. Gesell. Züchtungsk., No. 26 (1925), pp. 175, pls. 11*).—Measurements of 40 different parts of the body and head in addition to the live weights are reported for 12 heifer calves at monthly intervals from birth to 6 months and at 3-month intervals to 1 year of age, for 15 heifer calves at 3-month intervals from birth to 1 year and at 6-month intervals to 3½ years of age, for 18 heifers at 6-month intervals from 2½ to 4 years and at 5 years of age, for 53 5-year-old cows, and for 2 bull calves from 1 month to 1 year of age. The average meas-

urements at each age are tabulated and discussed in relation to the measurements of other parts. Curves are presented to show the rate of growth of the different parts of the body as determined by combining the data for the different groups of animals measured.

The range bull, C. U. Pickrell (*Ariz. Agr. Col. Ext. Circ. 51 (1925), pp. 48, figs. 22*).—This deals largely with the desirable characteristics of a range bull, also pointing out the necessity of proper care, management, and feeding for the production of good quality beef.

The origin and quality of commercial live stock marketed in Canada in 1923 [and 1924], H. S. Arkell (*Canada Dept. Agr., Livestock Branch Rpts. 4 (1924), pp. 54; 5 (1925), pp. 52, figs. 3*).—These publications deal with the origin and quality of livestock marketed in Canada during 1923 and 1924, and are similar to the previous report (E. S. R., 51, p. 274).

The utilization of minerals by ewes during the period of gestation, A. R. Winter (*Amer. Jour. Physiol., 73 (1925), No. 2, pp. 379–386*).—The results of studies at the Ohio Experiment Station of the metabolism of five Merino ewes during gestation are reported.

The ewes received daily rations of 700 gm. of alfalfa or timothy hay, 460 gm. of a grain mixture of oats, yellow corn, and linseed meal (4:2:1), and 12 gm. of sodium chloride. Part of the timothy hay was grown on poor acid soil and was low in calcium, while the rest was high in calcium. Supplements of 16 gm. of precipitated bone flour were also fed during certain of the periods, and one animal received 0.2 gm. daily of copper sulfate during one period.

The balances, which are tabulated for nitrogen, sulfur, magnesium, phosphorus, sodium, potassium, chlorine, and calcium, showed that all animals were storing nitrogen, sulfur, potassium, sodium, magnesium, and phosphorus, while 15 of the 22 calcium balances determined were negative. The chlorine balances varied but showed no regular relation to sodium or potassium. The storage of phosphorus was increased by the feeding of bone flour. The largest negative calcium balances occurred with the retention of large amounts of magnesium and the storage of small amounts of phosphorus. The negative calcium balances occurred on both timothy and alfalfa rations, though supplements of precipitated bone flour tended to change these balances to the positive. The average analyses of four lambs killed at birth showed that they contained 31 gm. of calcium and 20 gm. of phosphorus.

Sheep on the wheat farm and their management in western Australia, H. McCallum (*Jour. Dept. Agr. West. Aust., 2. ser., 2 (1925), No. 2, pp. 181–196, figs. 10*).—General directions for the management and classing of sheep on western Australian wheat farms.

Mohair, 1924–25 (*Port Elizabeth, Union of So. Africa: Hannam & Co., pp. 58, figs. 51*).—An account of the mohair production and trade in Great Britain and other countries of the world, with discussions of the outlook for mohair production.

The British Goat Society's year book for 1925, compiled by T. W. Palmer (*London: Brit. Goat Soc., 1925, pp. 179, pls. 26*).—This is the fifth yearbook of the British Goat Society, consisting mainly of articles of popular interest.

Investigations at the experiment station on pork production in 1924 [trans. title], N. Hansson and S. Bengtsson (*Meddel. Centralanst. Försöksv. Jordbruksomrädet [Sweden], No. 289 (1925), pp. 78, figs. 11*).—The work started in 1923 at the Åstorp Experimental Station, comparing the Swedish farm breed and Swedish Yorkshires as producers of pork (E. S. R., 53, p. 668), has been continued to include 203 animals delivered from the leading

breeding stations and which were all similarly fed and slaughtered for a study of the economy and rate of gain and the quality of the carcass produced.

Both breeds showed similar results as regards rapidity of growth, food requirements and slaughtering data. The average daily gains of the Swedish farm pigs and Yorkshires were 639 and 634 gm., respectively, and the feed requirements were 3.51 and 3.59 fodder units, respectively, per kilogram of gain. Both breeds yielded 63.3 per cent of their live weight for export meat. Comparisons with earlier experiments showed that these breeds were more efficient producers of pork than the common pigs used there. The quality of the meat was similar for the two breeds tested, but the Yorkshires surpassed in the shape and size of the ham, while the Swedish farm breed scored higher in the shoulder and distribution of back fat.

The litter size as reported by the breeders averaged 10.5 for the Swedish farm breed and 11.1 for the Yorkshires. An average of 2.0 of the former breed and 1.9 pigs of the latter breed died before weaning. Studies of the effect of breeding have indicated that much variability exists in different stocks of the same breed. Breeding to better boars tended to improve the quality of the offspring in many ways.

The effect of different factors on the desirability of the carcass for the export trade is discussed. Live weight seems to have a marked influence on grade and economy, weight of from 85 to 95 kg. being recommended for killing. Sows seemed to score consistently better than boars as regards the quality of the carcass. Longer animals tended to make more rapid gains, had less back fat, and showed a better distribution of the fat on the carcass. The shorter animals have, however, yielded a larger percentage of export bacon and produced somewhat better hams. It is pointed out that well-developed bellies are favored, though this characteristic is often associated with a larger amount of back fat.

Digestion trials with swine, II–IV, H. E. Woodman (*Jour. Agr. Sci. [England], 15 (1925), No. 1, pp. 1–25*).—The results of the following experiments are noted in continuation of this series (E. S. R., 53, p. 667):

II. *Comparative determinations of the digestibility of dry-fed maize, soaked maize, cooked maize, and flaked maize.*—Essentially noted (E. S. R., 53, p. 373).

III. *The digestibility of a coarse grade of middlings.*—The digestibility of the coarse wheat middlings fed in the above trials with corn products was determined with the same pigs in a daily ration of 1,200 gm. of middlings and 500 gm. of barley meal as follows: Total dry matter 70 per cent, organic matter 73, crude protein 80, ether extract 32, nitrogen-free extract 77, crude fiber 36, and ash 31 per cent. The mean daily nitrogen balances for the two pigs were +18.5 and +12.5 gm.

IV. *Note on the utilisation of whole milk by swine.*—The author has discussed the digestibility of whole milk by swine, based on the results of experiments in which swine received 2,000 gm. of crushed corn and 1 qt. of whole milk and in which corn was fed with middlings. In these experiments the whole milk was considered as being completely absorbed by the animal, but a comparison of the digestibility of the corn as determined when fed with milk or with middlings showed that there was a greater digestibility of all nutrients when fed with the milk. It is considered that the differences were due to the use of different animals in making the experiments, though a possible aid to digestibility by the milk is suggested or a detrimental effect of the middlings.

The value of animal feeds and their utility for swine production.—I, II [trans. title], N. Hansson (*Meddel. Centralanst. Försöksv. Jordbruksområdet [Sweden], Nos. 284 (1925), pp. 30, figs. 3; 285 (1925), pp. 28, figs. 2*).—Experiments conducted over a period of years in studying the value of dairy

products as feeds for swine have involved the use of over 400 animals. The results of these experiments have pointed toward a favorable influence from the inclusion of dairy products in the ration, especially in case of young animals and provided that the amounts are limited. In corroboration of other work 6 kg. of skim milk and 12 kg. of whey have been found approximately equal to 1 fodder unit. Nondiluted buttermilk was practically equal to skim milk in feeding value, and condensed whey was similar to uncondensed whey when compared on a dry matter basis, while whole milk had practically twice the feeding value of skim milk. Nonpasteurized skim milk and sweet skim milk proved superior to pasteurized and sour skim milk, respectively. The best results occurred from feeding the dairy products when the daily amounts per head were limited to from 3 to 4 kg. of buttermilk, 5 to 6 kg. of skim milk or not over 30 to 35 per cent of the nutrients of the ration, or 12 to 15 kg. of whey or a maximum of 35 per cent of the total nutrients of the ration. Whole milk was especially valuable from the time of weaning until a weight of from 19 to 20 kg. had been attained. The dairy products had a favorable influence on the dressing percentage of the animals and the quality of the fat, provided the amount of dairy products fed was not too great.

In the second article the feeding value of dairy products was compared with that of linseed cake, peas, blood meal, garbage, and herring meal. The amounts of the different feeds required to furnish 1 fodder unit were calculated as 0.65 kg. of herring meal, 0.65 kg. of blood meal, 1 kg. of ground peas, about 4 kg. of garbage, and somewhat more than 1 kg. of linseed cake.

It was found that the herring meal should not be fed in amounts greater than 150 to 200 gm. per head daily, as in larger amounts it tainted the meat. This feed was found not to be suitable when containing more than 3 per cent of salt. The best results were obtained with blood meal when not over 250 to 300 gm. were included in the daily ration. Ground peas and linseed cake were not as complete in the nutrients contained as feeds from animal sources, and they had an unfavorable effect on the dressing percentage and firmness of the fat. Garbage proved to be a good feed for young pigs, but varied in its quality. That coming from restaurants and hospitals was especially good in this respect.

Further investigations on the feeding value of rye bran of different milling grades and of rye germ [trans. title], F. Honcamp and C. Pfaff (*Landw. Vers. Sta., 103 (1925), No. 5–6, pp. 259–278*).—The digestibility of the nutrients has been determined with sheep for rye germ and rye mill feeds resulting when yields of flour obtained equaled 65, 82, and 95 per cent, respectively, of the grain. Three wethers approximately three years of age were used for making the determinations during periods of eight days in duration. A basal ration consisting of 600 gm. of clover hay was fed in each case in addition to 250 gm. of the rye mill feed or 150 gm. of the rye germ. The average digestibility as calculated for the rye feeds was as follows:

Digestibility of rye mill feeds

Kind of rye feed	Coefficients of digestibility					Starch value
	Organic matter	Crude protein	Nitrogen-free extract	Crude fat	Crude fiber	
	Per cent	*Per cent*	*Per cent*	*Per cent*	*Per cent*	*Per cent*
Mill feed after 65 per cent yield of flour	81.6	70.8	87.3	71.2	4.4	64.89
Mill feed after 82 per cent yield of flour	77.3	73.0	80.1	66.0	68.8	51.68
Mill feed after 95 per cent yield of flour	57.3	65.8	63.5	77.5	----------	41.26
Germ	83.3	93.9	87.6	89.1	----------	74.95

Swine feeding investigations, 1923–24, B. M. ANDERSON and H. W. MARSTON (*Kansas Sta. Circ. 118 (1925), pp. 6, fig. 1*).—The results of these investigations were noted (E. S. R., 52, p. 469).

The influence of sunlight on the mineral nutrition of swine, L. A. MAYNARD, S. A. GOLDBERG, and R. C. MILLER (*Soc. Expt. Biol. and Med. Proc., 22 (1925), No. 8, pp. 494, 495*).—In studying the effect of sunlight on the ability of swine to assimilate minerals, two trials were conducted at Cornell University, using two lots of 4 pigs each in both trials. The ration consisted of yellow corn meal, wheat middlings, and oil meal. One lot in each trial had access to direct sunlight, while the other was kept continuously indoors.

After 4 months' feeding all of the pigs in both trials receiving no sunlight developed the characteristic stiffness previously described (E. S. R., 53, p. 69). Only 1 of the 8 pigs having access to the sunlight showed this condition. With the exception of the latter pig, the ash content of the femurs was found to be markedly higher in the pigs receiving sunlight. Bone lesions similar to those described in the earlier publication were also observed in the confined animals.

Preliminary experiments in feeding city work horses, J. A. SIMMS (*Connecticut Storrs Sta. Bul. 132 (1925), pp. 333–350*).—The preliminary results of horse feeding experiments conducted in 1924 and 1925 with approximately 125 horses owned by ice companies in Bridgeport and Waterbury are given in this bulletin.

Three lots of horses in one stable, which were fed and handled alike, showed wide variations in their live weight. One lot made an average gain per head of 38 lbs. and another lot lost 65 lbs. each in 12 months, or a difference of 103 lbs. per head under similar conditions.

Tests were made of the effects of varying amounts of hay with 178 horses and grain with 38 horses. Legume hay was compared with grass hay in other experiments with 35 horses, and the use of molasses and skim milk was also investigated. The data on the various tests are tabulated, but concrete conclusions are not given because of the extreme variation found among the horses on the same rations, and, further, because the experiments were only supervised by monthly visits from the author. In general, the horses appeared to show no advantage from larger daily rations in hay than 1 per cent of their body weight. Legume hay was distinctly superior to grass hays. Molasses proved to be a good conditioner. The results with skim milk were not uniform.

A contribution to the knowledge of the early development of Rhenish draft horses [trans. title], HERING (*Arb. Deut. Gesell. Züchtungsk., No. 27 (1925), pp. VIII+88, pls. 9*).—Body measurements of 71 stallions and 103 mares recorded in the Göttinger and Hessian studbooks of German draft horses were tabulated and found to be similar in the average measurements of the different parts and the maximum and minimum measurements for each part.

The measurements recorded included height at withers, depth of chest, length of leg, height of back, height at croup, length from point of shoulder to point of hip, croup length, circumference of cannon bone on foreleg, width of chest, width of hip bones, and breadth of thighs. Similar measurements were made of 56 male and 99 female colts of the same breeds varying in age from birth to three years. These measurements were classified according to age by monthly periods up to one year, by 3-month periods up to two years, and by 6-month periods up to three years. Three undernourished colts and one born prematurely were tabulated separately. Average measurements of the different body parts are given for each age, and growth curves were

constructed therefrom. Percentage relationships between the different parts are also reported.

The effect of feeding fowls on thyroid gland, B. ZAVADOVSKY (*Endocrinology, 9 (1925), No. 2, pp. 125–136, figs. 4*).—Experiments in which thyroid in doses of from 1 to 12 sheep glands or from 1 to 1½ beef or horse glands was fed to about 60 fowls are reported. The results showed that large doses had a toxic effect, but the amount required was much greater than in mammals. The gland substance was found to have a specific action on the feathers, causing molting soon after administration. The new developing feathers were more or less white in color, even on dark-colored birds. A similar effect was produced by fresh or dried glands or by Poehl's thyroidin. This condition was not observed in control birds receiving similar amounts of meat or other gland substances.

The effect of single doses of thyroid gland on fowls, M. ZAVADOVSKI (*Endocrinology, 9 (1925), No. 3, pp. 232–241, figs. 3*).—The effects of the administration of thyroid to fowls was investigated at the Sverdlov University in 10 experiments. Molting and depigmentation of the feathers resulted from the administration of single doses of not less than 1 to 2 gm. of desiccated gland per kilogram from June to October. It was very difficult to produce a second molt, indicating the importance of the stage of feather development. Molting followed the thyroid administration in from 6 days for maximum doses to 13 days for small doses, and the white feathers appeared in from 17 to 29 days. Thyroid grafts produced depigmentation of the newly developing feathers on one fowl, but no molting occurred.

[Poultry experiments at the Agassiz Experimental Farm], W. H. HICKS (*Canada Expt. Farms, Agassiz (B. C.) Farm Rpt. Supt. 1924, pp. 38–41*).—The results of the following experiments are briefly noted:

Egg storage experiment.—In studying the effect of different types of cases and eggs for storage purposes, eggs were stored in a commercial plant in tight cases, commercial cases, as dirty eggs, washed eggs, clean eggs, clean fillers, dirty fillers, farm eggs, store eggs, small end up, and small end down. The result showed that the cases and fillers seemed to have very little influence on the quality of the eggs at the end of the storage period. Washing resulted in the production of no extras. Many of the farm eggs were cracked and molded, while the store eggs were weak and watery and a heavy shrinkage resulted. The end on which the eggs were placed markedly influenced the position of the yolk. All eggs were graded in flavor as good except the dirty eggs and those stored in dirty fillers, in which case the flavor was fair.

Confinement v. range.—In the comparison of confinement v. range for egg production, the third year's results showed that the confined birds produced an average of 178 eggs per bird as compared with 144 by the range lot.

Effect of confinement v. range on hatching results.—The average fertility of the eggs of the range birds was 88 per cent, of which 41.44 per cent hatched. Sixty per cent of the eggs produced by the confined birds were fertile, of which 31 per cent hatched. Of the chicks hatched from eggs laid by hens on the range during the previous season, 54.3 per cent were alive at the time of wing banding as compared with 56.4 per cent of the chicks produced from eggs laid by the confined birds.

Feeding.—Thirteen lots of 10 pullets each were selected for comparing various rations for egg production during the 9 months' period beginning December 21, 1923. The results showed that the greatest net returns resulted from a lot receiving the standard scratch mixture consisting of equal parts of wheat, oats, and cracked corn plus a mash consisting of ground wheat, ground corn, beef scrap, soy bean oil meal, oil cake, and charcoal

4 : 1 : 1 : 0.25 : 0.25 : 0.25. These birds ate the most expensive feed, and the average egg production was 188 eggs per bird. Two lots receiving the standard scratch mixture and a standard mash consisting of bran, shorts, ground oats, corn meal, beef scrap, and charcoal, 100 : 100 : 100 : 100 : 75 : 5, laid an average of 144 and 149 eggs per bird, respectively.

A lot receiving the standard scratch feed plus the standard mash without beef scrap laid an average of 175 eggs per bird, and the calculated profits were therefore high, since there was no charge for beef scrap. This lot received skim milk. Another lot similarly fed without skim milk produced an average of only 102 eggs per bird. Clover leaves, alfalfa, and Epsom salts proved poor substitutes for green feed. The omission of corn from the scratch feed resulted in greater and cheaper production in three pens as compared with the production in two check pens.

Poultry raising in Georgia, J. H. Wood (*Ga. Agr. Col. Bul. 280, rev. (1925), pp. 48, figs. 8*).—This consists of popular directions for poultry production, management, feeding, and the grading and marketing of eggs.

Poultry culture in Czechoslovakia, M. Kuklová (*Aviculture en Tchécoslovaquie. Prague: Min. Agr., 1924, pp. 32, pls. 2, figs. 11*).—A description of the poultry industry in Czechoslovakia is given.

Modern poultry keeping, G. Scott (*London: A. & C. Black, 1925, pp. X+181, pls. 8*).—A popular book on poultry production, with discussions of the different sources of income from poultry husbandry.

Producing and marketing quality eggs, L. W. Steelman (*Penn. State Col. Ext. Circ. 105 (1925), pp. 24, figs. 30*).—Popular directions for the marketing and grading of eggs.

A system of pedigree hatching and record keeping for poultry, G. O. Hall (*N. Y. Agr. Col. (Cornell) Ext. Bul. 117 (1925), pp. 29, figs. 23*).—Popular directions are given for the hatching of pedigreed chicks, including complete descriptions of the methods of recording and keeping the eggs and of separating and labeling the chicks.

Stocking hunting grounds with game fowl, E. Leroy (*Repeuplement des Chasses: La Culture du Gibier à Plume. Paris: Firmin-Didot & Co., [1924], 2. ed., pp. 380, pl. 1, figs. 35*).—Directions for the propagation of game fowl.

Transactions of the First World's Poultry Congress (*Assen, Netherlands: Roy. Ptg. Estab., Floralia, [1921], vols. 1, pp. 386+42+7, pls. 2, figs. 11; 2, pp. 183, pls. 29*).—An account of the papers presented and the proceedings of the First World's Poultry Congress, held at The Hague from September 5 to 9, 1921.

DAIRY FARMING—DAIRYING

Investigations of the protein requirements of the milch cow and the influence of protein rich and protein poor feeds on the amount and composition of milk [trans. title], A. Buschmann et al. (*Landw. Vers. Sta., 101 (1923), No. 1–4, pp. 216*).—The results of eight investigations conducted from 1904 to 1913, dealing with the effect of various changes in the amount of protein in the ration on the milk and fat production of dairy cows, are reported and discussed in relation to similar experiments by other investigators in the United States and European countries, as well as earlier results by the senior author (E. S. R., 20, p. 1175).

The first experiment reported dealt with the effect of adding nitrogen-free feeds in the form of sugar, starch, and coconut fat to the basal ration. In the second experiment 3 kg. of wheat bran in the daily ration were replaced by 3.5 kg. of barley or oats. The effect of replacing 1.1 kg. of dried yeast

and 1.9 kg. of rye bran by 1.4 kg. of ground oats; 0.9 kg. of cottonseed cake and 1.9 kg. of rye bran by 1.9 kg. of ground oats; and 0.9 kg. of dried yeast by 0.9 kg. of cottonseed cake was compared in the third experiment. In the fourth experiment 1 kg. of linseed cake was replaced by 0.2 kg. of flaxseed and 8 kg. of fodder beets. In the fifth experiment 0.65 kg. of sunflower cake and a like amount of linseed cake were replaced by 4.94 kg. of potatoes. In a longer experiment in which the periods were from 16 to 28 days in length, high protein feeds such as linseed cake were compared with barley and oats. The sixth experiment was made for further comparing protein rich feeds such as grains from the legumes with dried beet pulp. The eighth experiment lasted 116 days, during which high protein feeds such as peas and sesame cake were replaced by fodder beets in varying amounts during the different periods. The results of the different experiments as to the amount and composition of the feeds consumed and milk produced are given for the individual cows and the protein and energy requirements for milk production calculated.

The authors believe that the investigations indicate that the protein necessary for milk production is considerably less than that usually recommended. The dairy cow needs from 0.2 to 0.25 kg. of protein per 500 kg. of live weight daily for maintenance, and very little more than this amount is secreted daily in the milk. The influence of the ration on the fat content of the milk is discussed at some length, and it is concluded that differences observed with various feeds are not due to the protein content of the feeds but rather to other properties.

Mineral nutrients in the rations of dairy cows, J. B. ORR, A. and J. A. CRICHTON, and W. MIDDLETON (*Scot. Jour. Agr., 8 (1925), No. 3, pp. 312–318*).—In studies of mineral nutrition in dairy cattle at the Rowett Institute, 12 Ayrshire heifers were fed during two lactation periods. All received oat straw ad libitum, sodium chloride, brewers' waste, and a grain mixture of equal parts of rice meal, palm kernel cake, decorticated peanut meal, wheat offal, and molasses fed according to production. Six of the heifers received silage and 6 received turnips as succulent feeds. The cows were allowed pasture during 5 months in the year, at which time grain in reduced amounts was also given. The following amounts of minerals were added per ton of grain to the rations of 6 of the cows (3 receiving turnips and 3 silage); 56 lbs. of calcium carbonate, 28 lbs. of sodium chloride, 1 lb. of iron oxide, and 2 oz. of potassium iodide.

The average milk production and weights of the calves born to the cows in the different lots were found to increase in the second lactation in both groups of cows receiving minerals, while the cows not receiving minerals showed decreases in milk production and in the weights of their calves in the second lactation period. The health of the mineral-fed animals was also better. Four of the 6 cows receiving minerals had trouble with retained afterbirth following the second and third parturition, but all were otherwise normal. Of the cows in the nonmineral groups 2 reacted to the tuberculin test several times, 1 has suffered each winter from a condition resembling osteomalacia, 1 has suffered from several attacks of mastitis, and 1 has shown no signs of disease or malnutrition.

[Feeding experiments with dairy cattle at the Central Experimental Farm], G. B. ROTHWELL (*Canada Expt. Farms, Anim. Husb. Div. Rpt. 1924, pp. 11–24*).—The results of several comparative feeding tests with dairy cattle are briefly noted.

Alfalfa meal v. bran.—A group of 17 cows was selected for making a comparative feeding test of the value of alfalfa meal and bran. The feeding was

done in 3 periods of 2 weeks each. During the first and third periods the regular grain ration was fed, while in the second period alfalfa meal replaced the wheat bran in the ration. The results showed that the ration containing alfalfa meal produced slightly more milk and less fat than the ration containing bran, 354 lbs. of alfalfa meal proving equal to 43 lbs. of silage, 9 of hay, 8 of grain, and 358 lbs. of bran. In a further experiment similarly conducted, using 18 cows, the milk production on the alfalfa meal and bran rations was practically the same, but the fat production was slightly greater with the bran. A third experiment conducted in a similar manner showed some superiority for the bran ration, both in milk and fat production. The average of the last two experiments indicated that 617.4 lbs. of bran and 80 lbs. of silage were equivalent to 625.8 lbs. of alfalfa meal, 22 lbs. of hay, and 19.4 lbs. of grain. It is concluded that alfalfa meal, though a good feed for dairy cows, is not as valuable as bran for milk and fat production.

Corn silage v. roots (mangels) for dairy cows.—Seventeen cows were selected for comparing rations of corn silage and roots with combinations of the two during 5 experimental periods of 2 weeks each. In the first, third, and fifth periods the average ration fed consisted of 22 lbs. of corn silage and 37 lbs. of roots with hay and grain. During period 2 32 lbs. of corn silage, and during period 4 85 lbs. of roots, were the only succulent feeds given. A comparison of the production during periods 1, 2, and 3 indicated that the corn silage and roots ration produced 7 per cent more milk and 6.5 per cent more fat than the straight silage ration, but the increased milk production was also at an increased cost, estimated at 9 cts. per 100 lbs. of milk. The 4,410 lbs. of roots fed proved equal to 98 lbs. of grain, 119 lbs. of hay, and 1,495 lbs. of silage. A comparison of the mixed silage and root ration with the straight root ration showed an advantage for the root ration of 5.38 per cent for milk but a decrease of 1.6 per cent in the fat production. The cost of the milk production was also 9.3 per cent higher. Sixty-four lbs. of grain and 2,767 lbs. of silage proved equal to 39 lbs. of hay and 5,467 lbs. of roots.

Corn silage v. oats, peas, and vetch silage.—Seventeen 2-year-old heifers were used for comparing the feeding value of 30.8 lbs. of oat, pea, and vetch silage with 28.7 lbs. of corn silage fed during 4 periods of 3 weeks each, the oat, pea, and vetch silage being fed during the first and third periods and the corn silage during the second and fourth. A comparison of the average results of the first and third periods with the second period indicated that the corn silage ration produced 95.78 lbs. more milk but 8.29 lbs. less fat than the oat, pea, and vetch silage ration. The comparison of the average results of periods 2 and 4 with period 3 led to the same conclusion. There were required 48 lbs. of grain, 58 lbs. of hay, and 7,430 lbs. of oat, pea, and vetch silage to equal 6,832 lbs. of corn silage. A pronounced increase in fat percentage was evident in both sections of the experiment when oat, pea, and vetch silage was given.

Corn silage v. sweet clover silage.—Corn silage and sweet clover silage were compared as to their feeding value by using 21 cows during 6 test periods of 3 weeks each. Each type of silage was fed in addition to the basal ration in alternate periods. The method of feeding allowed 4 separate comparisons between the 2 types of silage. The average results indicated that 18,220 lbs. of sweet clover silage, 206 lbs. of grain, and 218 lbs. of hay were required to replace 18,277 lbs. of corn silage. Sweet clover silage thus did not appear to be equal to corn silage, but it invariably produced more fat from the same or smaller quantities of milk.

Hull-less oats and minerals in calf feeding.—In studying the feeding value of hull-less oats and the need of minerals by calves, 6 lots of 3 each, averaging

from 109 to 146 lbs., were selected for making such a test during 152 days. The grains and minerals used for comparison were fed with skim milk in a jelly-like consistency after cooking. The mixtures as fed were lot 1 ground oats, ground corn, and ground flaxseed (2:2:1), lot 2 hull-less oats, ground corn, and ground flaxseed (2:2:1), lot 3 ground oats, hull-less oats, corn, and ground flaxseed (1:1:2:1), lot 4 ground oats, hull-less oats, and ground flaxseed (2:2:1), lot 5 ground oats, corn, and ground flaxseed (2:2:1) plus 5 per cent blood meal, and lot 6 ground oats, ground corn, and ground flaxseed (2:2:1) plus 2.5 per cent of a mineral mixture consisting of calcium phosphate, sodium phosphate, Epsom salts, Glauber's salts, sulfur, and common salt. All calves had access to a dry grain mixture composed of ground oats, bran, distillers' grain, and oil meal, as well as alfalfa hay. The average daily gains made by the calves in the different lots in their respective numerical order were 1.67, 1.77, 1.65, 1.91, 1.57, and 1.50 lbs. per head. The author concludes that hull-less oats is an excellent feed for growing calves. The addition of minerals in the form of blood meal or as a mineral mixture did not increase the rate of gain.

[Feeding experiments with dairy cattle at the Indian Head Experimental Farm], W. H. Gibson (*Canada Expt. Farms, Indian Head (Sask.) Farm Rpt. Supt. 1924, p. 7*).—The results of two experiments in the feeding of corn and sunflower silage are briefly noted.

Corn silage v. sunflower silage as a basic roughage for pregnant cows.—Five lots of cows were selected for comparing various mixtures of corn silage, sunflower silage, straw, and alfalfa hay, with and without minerals. It is noted that when minerals were fed in conjunction with sunflower silage the calves born were normal and healthy, but that when sunflower silage was fed with either straw or alfalfa hay, one calf from each lot showed signs of goiter trouble.

Corn silage v. sunflower silage for growing heifers.—Ten heifers were used for making a comparison of the value of corn and sunflower silage for the development of growing heifers during five 4-week periods. It is reported that the heifers receiving corn silage were thriftier in appearance and in better condition than those receiving sunflower silage. The total gains made on the sunflower silage ration were 460 lbs. and on the corn silage ration 485 lbs.

The history of Simmentaler cattle breeding in Hohenheim during the course of 100 years and its teaching with relation to animal importation, the establishment of color, production of blood lines, and inbreeding [trans. title], G. Miltner (*Ztschr. Tierzüchtung u. Züchtungsbiol., 4 (1925), No. 1–2, pp. 1–70, pls. 5*).—Mainly an historical account.

Circumstances influencing the yield and quality of milk, J. Mackintosh (*Highland and Agr. Soc. Scot. Trans., 5. ser., 37 (1925), pp. 126–145*).—This is mainly a discussion of the factors influencing the yield and quality of milk. The effects of breed, individuality, period of lactation, interval between milkings, efficiency of the milker, age of the cow, climate and weather conditions, health of the cow, and kind and quality of feed are taken up in turn.

Variation and constancy in the quantity of milk and the fat content of morning and evening milk in the different seasons and according to the interval between milkings [trans. title], J. Stremler (*Lait, 5 (1925), No. 44, pp. 353–359, figs. 2*).—Determinations of the butterfat content and amount of milk produced in the morning and evening milkings by from 3,500 to 4,000 cows during almost three years showed that in the winter, when the time between morning and evening milkings was very short, the fat content of the evening milk was higher than that of the morning milk. The quantity of

milk was lower in the winter for the evening milk. Both conditions were reversed in the summer, due to a longer period between morning and evening milkings.

Pasteurization of milk, M. CASE (*New Rochelle, N. Y.: Knickerbocker Press, 1925, pp. 22*).—A brief history of pasteurization of milk with relation to health.

The whole milk trade: How research has benefited producers and consumers, R. S. WILLIAMS (*Farmer and Stock-Breeder and Agr. Gaz., n. ser., 39 (1925), No. 1880, p. 2311*).—A popular article dealing with the way research has benefited the producers and consumers of dairy products.

Manufacture of Roquefort type cheese from goat's milk, S. A. HALL and C. A. PHILLIPS (*California Sta. Bul. 397 (1925), pp. 3–20, figs. 11*).—Roquefort cheese has been successfully manufactured from goat's milk and from mixtures of goat's and cow's milk. The addition of the latter has been found beneficial in reducing the loss of butterfat in the whey. Complete directions for the successful manufacture of Roquefort cheese from goat's milk are given.

Statistics relative to the dairy industry in New York State, 1923 [and 1924] (*N. Y. State Dept. Farms and Markets, Agr. Buls. 170 (1924), pp. 64, figs. 7; 180 (1925), pp. 66, figs. 5*).—Summaries of the dairy statistics of New York State for 1923 and 1924 are given and compared with previous years (E. S. R., 50, p. 581).

The National Institute for Research in Dairying annual report, 1924, R. S. WILLIAMS ET AL. (*Natl. Inst. Research Dairying [Reading] Ann. Rpt. 1924, pp. 42, pls. 10*).—A brief report of the finances aud work of the institute for 1924.

VETERINARY MEDICINE

Ninth [and tenth] biennial report[s] of the Kansas Live Stock Sanitary Commissioner, 1921–1922 [and 1923–1924], J. H. MERCER (*Kans. Livestock Sanit. Commr. Bien. Rpts., 9 (1921–22), pp. 99, figs. 6; 10 (1923–24), pp. 215, figs. 14*).—The usual biennial reports (E. S. R., 46, p. 178), including accounts of infectious diseases of livestock and control work therewith.

Yearbook [of the] Michigan State Veterinary Medical Association (*Mich. State Vet. Med. Assoc. Proc., 42 (1924), pp. 161*).—This reports the proceedings of the annual convention of the association held at East Lansing in June, 1924. Papers are included on Rabies, by A. S. Schlingman (pp. 53–62); Damaged Sweet Clover, the Cause of a Serious Disease in Cattle, by F. W. Schofield (pp. 90–101); Practical Measures in the Control of Abortion Disease and Its Sequelae, by L. H. Smith (pp. 105–114); and Canine Distemper and Its Complications, by M. R. Thynge (pp. 116–122).

[Reports of the Civil Veterinary Department, Assam, 1922–23 and 1923–24], G. P. SEN and W. HARRIS (*Assam Civ. Vet. Dept. Rpts., 1922–23, pp. 2+17; 1923–24, pp. [2]+17*).—The usual annual reports (E. S. R., 48, p. 480) upon the occurrence of infectious diseases of livestock, the details being presented in tabular form.

Annual report of the Bengal Veterinary College and Civil Veterinary Department, Bengal, for the year 1923–24, R. T. DAVIS and G. S. DUTT (*Bengal Vet. Col. and Civ. Vet. Dept. Ann. Rpt. 1923–24, pp. 6+III+10+XVII+3*).—The usual annual report (E. S. R., 51, p. 381) upon the occurrence of infectious diseases of livestock and control measures.

A pharmacodynamic study of the anthelmintic properties of western oils of chenopodium, A. R. BLISS, JR. (*Jour. Amer. Vet. Med. Assoc., 66 (1925), No. 5, pp. 625–630*).—The author's study has shown that oil of chenopodium properly distilled from plants cultivated in the Middle Western States is as efficacious against ascarids in dogs as the Maryland oil of chenopodium.

Geographical distribution of the serologic groups of Brucella melitensis, A. C. Evans (*Amer. Jour. Trop. Med., 5 (1925), No. 6, pp. 419–423*).—Data here presented have been substantially noted from another source (E. S. R., 53, p. 886).

Foot-and-mouth disease: First progress report of the research committee (*Jour. Compar. Path. and Ther., 38 (1925), No. 3, pp. 227, 228*).—The conclusions of the report, previously noted (E. S. R., 54, p. --) are here presented.

Review of recent work on Malta fever [trans. title], E. Burnet (*Bul. Inst. Pasteur, 23 (1925), Nos. 9, pp. 369–382; 10, pp. 417–432*).—This is a report of investigations of Malta fever and the relation of *Micrococcus melitensis* to *Bacterium abortus*. A list of 74 references to the literature is included.

Bacteriophage tests on the meconium of aborted fetuses, E. S. Sanderson (*Jour. Expt. Med., 42 (1925), No. 4, pp. 561–563*).—The objection by d'Hérelle (E. S. R., 48, p. 675) to the theory that tissue cells are the source of bacteriophage, on the grounds that bacteriophage in the intestinal contents can penetrate the intestinal mucosa and migrate throughout the body and that any demonstration of its presence within the body fluids is in accordance with this phenomenon, led to the investigation here reported. The author sought to overcome the objection by using tissues which had been exposed to but a single organism—*Bacillus abortus*. Filtrates of meconium from six aborted bovine fetuses were tested against several strains of *B. abortus*, but no evidence of a lytic principle could be demonstrated. Neither could it be shown that they contained a substance which would initiate lysis when tested against numerous strains of bovine colon bacilli.

Attention is called to a paper by Surányi and Kramár.[5] In their study of 10 newborn infants, no bacteriophage active for organisms of the colon-dysentery group could be demonstrated in the meconium, and, furthermore, such a bacteriophage was not detected until after the fourteenth day of life.

Recent Bureau of Animal Industry Experiment Station bovine infectious abortion studies, E. C. Schroeder and W. E. Cotton (*Jour. Amer. Vet. Med. Assoc., 66 (1925), No. 5, pp. 550–561*).—This is a review of work which was presented at the annual meeting of the American Veterinary Medical Association at Des Moines, Iowa, in August, 1924.

Bovine infectious abortion, M. F. Barnes (*Penn. Dept. Agr. Bul. 404 (1925), pp. 25*).—A practical summary of information including means of control.

Abortion in cattle caused by Vibrio fetus, A. T. R. Mattick (*Jour. Compar. Path. and Ther., 38 (1925), No. 3, pp. 221–223*).—The author reports upon the occurrence of abortion in a 3-year-old cow due to *V. fetus*.

Bacillus pyogenes and its relation to bovine mastitis, W. Jowett (*Jour. Compar. Path. and Ther., 38 (1925), No. 3, pp. 180–204, figs. 9*).—In the course of the author's studies, nine strains of *B. pyogenes* were isolated from pus and altered milk secretion from cases of bovine mastitis, and one strain was obtained from the pus contained in multiple abscesses present in the liver and lungs of a 4-months-old calf. Brief accounts are first given of the symptoms and of the morbid anatomy and histology of cases of bovine mastitis with which the organism has been found associated. Then follow reports on studies of the morphology and cultivation of the organism, immunology, pathogenicity, and public health.

The author concludes that there is nothing on record to indicate whether or not *B. pyogenes* is pathogenic for mankind. It is pointed out that, since the organism is present in the udder and milk secretion in certain forms of

[5] Monatsschr. Kinderheilk., 28 (1924), pp. 330–333.

bovine mastitis, *B. pyogenes* may be ingested by man if the secretion from a diseased quarter of the udder gains access to the milk.

Bacteriological findings in twenty cases of mastitis, H. G. LAMONT (*Jour. Compar. Path. and Ther., 38 (1925), No. 3, pp. 213–221*).—Streptococci were met with in 14 cases, and in pure culture in 5 of these, while staphylococci were met with in 6 cases. Colon organisms (lactose-fermenting Gram-negative bacilli) were met with in 7 cases (35 per cent) and in pure cultnre in 1 case. A slender, slightly curved Gram-positive bacillus, tending to stain more deeply at either end so that it sometimes appeared as a diplococcus, and of which cultures were only obtained on media containing blood serum, was met with in 7 cases (35 per cent), and in pure culture in 3 of these (15 per cent). A nonlactose-fermenting bacillus was met with in 2 cases, and in 1 case in considerable numbers (*B[acterium] alkaligenes faecalis*). In three cases a peculiar ovoid coccus was cultivated which resembled very much the appearance of mouse feces. A profuse growth of this organism was obtained in one of the cases.

Staphylococcal and streptococcal dermatitis of the udder in dairy cows, T. HARE (*Vet. Rec., 5 (1925), No. 44, pp. 943–953, pl. 1, fig. 1*).—In this paper the author attempts to define two specific types of dermatitis of the udder, namely, (1) folliculitis, a slowly spreading contagious staphylococcal suppurative inflammation of the pilosebaceous glands of the udder and (2) impetigo, a rapidly spreading coutagious streptococcal superficial inflammation of the skin of the teats, and to differentiate these two affections from other specific types of dermatitis of the udder.

The potency of anti-cattle plague serum, D. S. RABAGLIATI (*Jour. Compar. Path. and Ther., 38 (1925), No. 3, pp. 204–213*).—The author finds: (1) That the potency of anticattle-plague serum made from blood drawn within five weeks of the simultaneous inoculation can not always be relied on, (2) that before the classic method of hyperimmunization be given up careful tests of this new method should be made in the country concerned, and (3) that under the old hyperimmunization method serum cattle can produce a potent serum for at least four years, and probably for much longer periods.

Diseases and pests affecting sheep and goats in South Africa, with methods of treatment (*Berkhamsted, Eng., and Johannesburg: William Cooper & Nephews, 4. ed., rev., pp. 120, figs. 18*).—This is a practical account.

Tuberculosis of the sheep, A. S. GRIFFITH (*Jour. Compar. Path. and Ther., 38 (1925), No. 3, pp. 157–180*).—This is a report of two cases of tuberculosis in sheep, one of which is considered to be of great interest from the bacteriological point of view. Cultures of the virus of this case exhibited for fowls and mammals the pathogenic properties of the avian type of tubercle bacillus, but in their cultural features they resembled a mammalian strain, growing on glycerin agar, potato, and broth like a relatively eugonic bovine strain. The serological reactions of the strain were those of mammalian tubercle bacilli. It is pointed out that the virus may have been originally typically avian but during residence in the tissues of the sheep became modified in cultural characters, or the avian tubercle bacilli in their natural hosts may not all conform to one cultural type, i. e., there may be cultural variants of the avian tubercle bacillus just as there are of mammalian tubercle bacilli.

Observations on septic gangrene in lambs [trans. title], R. MOUSSU and J. PERROT (*Rec. Méd. Vét., 101 (1925), No. 11, pp. 333–337; abs. in Vet. Rec., 5 (1925), No. 45, pp. 985, 986*).—This is an account of an outbreak of a disease in lambs caused by a small micrococcus identical with the one described by Nocard in 1887 as the cause of gangrenous mammitis of ewes. Of 59 lambs,

16 died. Subcutaneous injections of microbic extracts daily for from four to six days following its appearance gave quite satisfactory results.

Demodectic mange of the goat in the United States, E. B. Cram (*Jour. Amer. Vet. Med. Assoc., 66 (1925), No. 4, pp. 475-480, figs. 5*).—This is a report of a case occurring in a Toggenburg goat at Rochester, Minn.

Blood chemistry of the horse, R. L. Holt and F. H. K. Reynolds (*Jour. Amer. Vet. Med. Assoc., 65 (1924), No. 6, pp. 732-736*).—This is a report of tests made upon both normal and diseased horses with a view to ascertaining an average for the normal animal with which could be compared the results of tests of blood from those suffering from disease. The work embraced 150 cases, requiring 900 separate determinations. Blood was procurable in but 8 cases of disease, embracing laminitis 2, periodic ophthalmia 2, strangles 1, dermatitis 1, rhinitis 1, and chronic articular rheumatism 1.

Eberthella viscosa (Bact. viscosum equi), etiological factor in joint-ill, E. M. Snyder (*Jour. Amer. Vet. Med. Assoc., 66 (1925), No. 4, pp. 481-486*).—This is a contribution from the Kentucky Experiment Station, in which the author reports upon the isolation of *E. viscosa* from several foals, and calls attention to its occurrence in America as well as in foreign countries.

***The existence of an autochthon focus of equine piroplasmosis due to* Piroplasma caballi in the Haute-Marne** [trans. title], M. Gaupillat and Neveux (*Ann. Parasitol. Humaine et Compar., 3 (1925), No. 4, pp. 375-383, fig. 1*).—The authors record observations of a second focus[6] of equine piroplasmosis in France due to *P. equi*, in the Haute-Marne, a microscopic diagnosis of seven cases having been made during a period of a few weeks. The tick *Dermacentor reticulatus* was collected on apparently normal as well as diseased horses and on dogs. Treatment by trypan blue proved effective.

A note on treatment of surra in ponies by tartar emetic, K. Singh (*Punjab Dept. Agr., Vet. Bul. 13 (1924), pp. 39*).—From experiments conducted, the author concludes that the injection of tartar emetic gives a promise of success in the treatment of natural surra in ponies, if made properly under all possible facilities. No hopes of recovery are given for ponies once paralyzed.

A short report of similar work with donkeys has been noted (E. S. R., 53, p. 183).

The hematology of dogs affected with sarcoptic and acarus mange, with particular consideration of the eosinophil cells, F. Kieback (*Das Blutbild des an Sarcoptes- und Acarusräude Erkrankten Hundes unter Besonderer Berücksichtigung der Eosinophilen Zellen. Inaug. Diss., Tierärztl. Hochsch., Berlin, 1924, pp. 23*).—A report of studies at the Veterinary High School at Berlin of 5 normal and 41 affected animals.

Handbook of the diseases of fowls, R. Reinhardt (*Lehrbuch der Geflügel-Krankheiten. Hannover: M. & H. Schaper, 1925, 2. ed., rev. and enl., pp. 430, pl. 1, fig. 60*).—A second, revised and enlarged, edition of the work previously noted (E. S. R., 48, p. 382).

The occurrence of a disease of chickens in New York State caused by a filtrable virus, E. L. Brunett (*Jour. Amer. Vet. Med. Assoc., 66 (1925), No. 4, pp. 497, 498*).—The author records the occurrence of a disease of chickens due to a filtrable virus which is similar to, if not identical with, fowl plague.

Edema of the wattles in cockerels, D. E. Davis (*Jour. Amer. Vet. Med. Assoc., 66 (1925), No. 5, pp. 588-598, figs. 3*).—Experiments in the control of this affection in California have led to the conclusion that cropping the wattles of the males in infected flocks is the most practical method, preventing losses and not disqualifying the birds for show purposes.

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[6] Compt. Rend. Soc. Biol. [Paris], 90 (1924), No. 18, p. 1308.

Nightshade poisoning in chickens and ducks, A. A. Hansen (*Jour. Amer. Vet. Med. Assoc., 66 (1925), No. 4, pp. 502, 503, fig. 1*).—This is a contribution from the Indiana Experiment Station, recording the loss of nine ducks and six chickens on a farm at Cypress, in October, 1924, due to poisoning by black nightshade (*Solanum nigrum* L.)

Sarcocystis rileyi from the domesticated duck, [M. C.] Hall (*Jour. Parasitol., 11 (1925), No. 4, p. 217*).—The author records the heavy infestation of a domesticated duck purchased in the market at Washington, D. C., with *S. rileyi* Stiles. This is considered to be the first record of its infestation of a domesticated duck.

Investigations of the coccidia and coccidioses of the rabbit, II [trans. title], C. Pérard (*Ann. Inst. Pasteur, 39 (1925), No. 6, pp. 505–542*).—This second part of the author's studies (E. S. R., 53, p. 280) consists of a contribution to the study of the biology of the oocysts of coccidia. A bibliography of 32 titles is included.

AGRICULTURAL ENGINEERING

Agricultural engineering at the experiment stations, R. W. Trullinger (*Agr. Engin., 6 (1925), No. 10, pp. 235–237*).—A critical summary of the research under way at the stations is presented and briefly discussed. Emphasis is placed upon the importance of a more thorough consideration of the exact requirements of agricultural practices to provide definite purpose and direction for engineering investigations. Cooperative efforts by groups of stations on problems of common interest are also suggested.

Some agricultural engineering problems of western irrigation practice, S. H. Beckett (*Agr. Engin., 6 (1925), No. 10, pp. 228, 229, figs. 2*).—In a brief contribution from the University of California some of the agricultural engineering problems of irrigation practice are enumerated, including the design and construction of farm ditches, farm irrigation structures, measurement of irrigation water, seepage losses and ditch linings, and the design and construction of conduit systems of delivery.

Effect of Rio Grande storage on river erosion and deposition, L. M. Lawson (*Engin. News-Rec., 95 (1925), No. 10, pp. 372–374, figs. 6*).—Observations made by the Bureau of Reclamation, U. S. Department of the Interior, are reported, which indicate that the general effect of the Elephant Butte reservoir on river conditions is that the large destructive floods have been prevented and the total amount of sediment in the lower river is a small percentage of that formerly carried. The elevation of the lower river channel is due to the lack of proper slope and the decrease of flow. No great degradation of the river channel is found in the upper reaches of the river, and such a tendency is retarded by the existence of diversion dams and canyon sections. Everything indicates that the lower river must be confined within definite limits and on a proper gradient so that hydraulic conditions will exist in keeping with its use as a main canal and wasteway.

Relation of depth to curvature of channels, H. C. Ripley (*Amer. Soc. Civ. Engin. Proc., 51 (1925), No. 10, [pt. 3], pp. 1907–1938, figs. 10*).—The results of investigations into the law of channel hydraulics are reported. From these results two empirical formulas were devised, by means of which the cross profile of a channel may be computed. Some characteristics in the law of channel hydraulics not heretofore known were also disclosed.

The increasing curvature in bends was found to increase the depth only to a certain point. This point is reached when the radius of curvature is equal to 40 times the square root of the area of the cross section. Where the channel occupies the entire waterway, and the radius of curvature exceeds about

50 times the square root of the area of the cross section, the cross profile may not conform strictly to that due to curvature. Hence, the efficiency of the derived formula to reproduce results is restricted to those channels having a radius of curvature not exceeding this amount.

It appears, therefore, that in channels occupying the entire waterway, any curvature greater than that due to a radius of curvature equal to 40 times the square root of the cross sectional area is ineffective in producing increased depths, and any curvature less than that due to a radius of curvature equal to about 50 times the square root of the cross sectional area may have irregularities which can not be reproduced. A single curved jetty will produce a deeper channel than two parallel jetties of the same curvature.

Some practical applications of the formulas are given.

The hexagonal slab design of concrete pavement, L. A. PERRY (*Amer. Soc. Civ. Engin. Proc., 51 (1925), No. 9, [pt. 3], pp. 1793–1808, figs. 11*).—The results of experiments to determine what relation the shape of a pavement slab has on its strength are reported. With the records of these experiments, a study of moments, as developed in various shaped slabs, is also reported.

It is concluded to be incorrect to compensate for a pronounced weakness in design when that weakness may be eliminated. The right angle corner was found to be a pronounced weakness, and is therefore considered to have no rightful place in a concrete pavement except where it must occur along the outer edge. It was further found that harmful temperature cracks which intersect and form corners in an oversized slab may be avoided by a reasonable reduction of the slab area. The necessity of forming reasonably small slabs to avoid these cracks may be met without the formation of interior right angle corners.

It is believed that the economical design is a grouping of slab units of plain concrete, each unit sized so as to prohibit temperature cracks and excessive bending moments, and entirely independent of and disconnected from adjacent slabs, which prevents injury to any one slab by reason of the displacement or failure of its neighbor. It is believed further that each slab should be cast in the shape of a hexagon.

Facts about peat, B. F. HAANEL (*Canada Dept. Mines, Mines Branch [Pub.] 614 (1924), pp. 48*).—A large amount of information relating to the value and use of peat as a fuel is presented.

Conditions for obtaining from the Bavarian Commission of Technology and Agriculture a certificate of recognition for agricultural machines and implements, CHRISTMANN (*Internatl. Rev. Sci. and Pract. Agr. [Rome], n. ser., 2 (1924), No. 3, pp. 583–588*).—The conditions and procedure involved in this matter are outlined.

Press work in agricultural machinery plants, C. C. HERMANN (*Machinery, 32 (1925), No. 3, pp. 218, 219, figs. 6*).—In the third article of this series, the drawing dies employed in producing two sheet-steel parts for farm machinery are described and diagrammatically illustrated.

A thermodynamic analysis of gas engine tests, C. Z. ROSECRANS and G. T. FELBECK (*Ill. Univ. Engin. Expt. Sta. Bul. 150 (1925), pp. 95, figs. 27*).—An investigation to apply a rational thermodynamic analysis of the constant volume cycle to test results obtained from an engine operating on such a cycle and, from a comparison of results of experiments, to determine the factors which prevent the actual engine from attaining the ideal performance, is reported.

A method was developed for calculating the ideal adiabatic Otto cycle, which gives results differing from the actual cycle by amounts which can be accounted for by the various engine losses. A method was also developed for

estimating the progress of the explosive reaction during the expansion stroke and for determining the time at which the reaction is practically complete.

The thermal efficiency of the engine tested at first increased with increasing air-gas ratios, finally attaining a maximum, and then decreased as the air-gas ratio increased. The thermal efficiency also increased rapidly at first with increasing compression ratio and tended to reach a maximum value at a compression ratio of about 6 to 1. When the compression ratio was increased beyond this point, the thermal efficiency decreased and the operation of the engine became irregular.

The curves of ideal thermal efficiency and indicated thermal efficiency obtained were of the same shape and were practically parallel, substantiating the accuracy of the theoretical analysis of the cycle. The effect of dissociation with the particular fuel used was found to be very slight, and the dissociation at the calculated maximum temperature in most cases was zero. The theoretical analysis gave results which agreed very well with the air-standard efficiencies when the cycle was based on the operation of pure dry air.

The effect of different fuels on the thermal efficiencies was found to be slight. It was definitely established that the reaction in the cylinder is not complete at the instant when maximum pressure and temperature are attained. The continuation of the reaction occurring late in the stroke is sometimes caused by slow combustion, and sometimes by the fact that the gas in the valve pockets and other outlying parts in the combustion space is not ignited until late in the stroke.

The general tendency of the reaction velocity was to decrease with weaker fuel mixtures. No definite effect of compression ratio on reaction velocity was evident. The heat loss during compression, explosion, and expansion was found to decrease rapidly with increasing air-gas ratios, due to the lower gas temperatures attained with the weaker mixtures. Compression ratio had less effect on the heat loss from the gas than did the mixture ratio.

Some facts about stationary spray plants, W. P. DURUZ and B. D. MOSES (*Amer. Fruit Grower Mag., 45 (1925), No. 2, pp. 41, 43, 56, figs. 4*).—In a contribution from the California Experiment Station data on stationary spray plants, with particular reference to the requirements of California orchards, are presented and discussed.

Rural electrification in California, B. D. MOSES and G. C. TENNEY (*Jour. Elect., 54 (1925), No. 12, pp. 581–585, figs. 9*).—An outline is given of the rural electrification work in progress in California, much of which is being done at or in cooperation with the California Experiment Station. The work has shown that the principal agricultural users of electricity, aside from the home, are the poultryman, orchardist, dairyman, and farmer requiring pumped water for irrigation. Several miscellaneous uses for general farming are also mentioned. The greatest need is said to be for a portable motor between 5 and 10 h. p. for utility purposes.

The farm electrified (*Penn. Dept. Agr. Bul. 407 (1925), pp. 37, figs. 15*).—A description is given of the electric farm exhibition held at Harrisburg from January 14 to 24, 1925, during the Pennsylvania State farm products show.

Snook O'Brien's model diversified electrical farm, J. W. OTTERSON (*Jour. Elect., 54 (1925), No. 12, pp. 591–594, fig. 1*).—A description is given of a farm in the San Joaquin Valley of California which was laid out to show, through statistics and a miniature reproduction of the hypothetical farm, the relation of the cost of electricity to the gross returns when a number of crops are being raised on one farm. It has been found that by securing this diversification a smaller installation is possible, a greater load factor is secured, and the

peak demand is reduced considerably to the benefit of the central station and the consumer alike.

Cork lined concrete houses, H. Whipple (*Concrete [Chicago], 27 (1925), No. 5, pp. 15–20, figs. 12*).—This type of insulated dwelling construction is described and profusely illustrated.

Making a tool and nail box, L. M. Roehl (*N. Y. Agr. Col. (Cornell) Junior Ext. Bul. 14 (1925), pp. 31, figs. 33*).—Practical information on the subject is presented.

The experimental sullage farm, Lyallpur, P. E. Lander (*Agr. Research Inst., Pusa, Bul. 157 (1925), pp. [2]+25, pls. 2, figs. 6*).—The results of experiments being carried on at the experimental sullage farm at Lyallpur from the time of their commencement at the end of 1917 up to June, 1924, are presented. This farm owes its origin to the fact that the town sewerage system is situated so close to the Lyallpur Agricultural College as to constitute a nuisance. Experimental cultivation was therefore undertaken with sewage diluted with canal water. The present farm is not entirely satisfactory, its uneven fertility and small size tending to militate against the obtaining of as accurate results as are desirable.

It has been found, however, that the natural fluctuations in the total nitrogen content of the soil even over short periods of time are out of all proportion to the nitrogen which has been applied in the sullage water. The improved crop yields are therefore apparently not the result merely of an increased application of nitrogen over that contained in the canal water, but also depend on certain accessory factors which the sullage water furnishes and which may be possibly placed in the same category as the well-known accessory food factors so important to animal life.

Wheat is apparently unsuited for treatment with sullage owing to its great tendency to lodge when growth is forced. The crops best suited for treatment with sullage have been found to be green fodders, vegetables, and sugar cane, where a forced vegetative growth is required. Maize does very well and can occupy the ground from April to October, after which it can be followed by winter oats. This is apparently one of the best rotations for the use of sullage water.

Underground vegetables tend to crack and burst when grown on soil treated with sullage water except when in great dilution. This was particularly noticeable in carrots and turnips. On the other hand, vegetables such as cauliflower and spinach, the edible portion of which is above ground, were improved in both condition and yield by sullage water. Thick sugar cane has not so far done well on the farm.

The fallacy of the test for lactose fermenters as an indicator of faecal pollution of waters, O. Schöbl and J. Ramirez (*Philippine Jour. Sci., 27 (1925), No. 3, pp. 317–324*).—In a contribution from the Bureau of Science, Manila, studies are reported which showed that even though lactose fermenters other than true *Bacillus coli* are frequently present in human and animal feces, these bacteria as a group can not be considered as an indication of fecal contamination owing to their wide distribution in nature and to their presence in places where fecal contamination is excluded. On the other hand, it is thought justifiable to consider true *B. coli* as an indicator of fecal pollution owing to its relatively limited distribution outside of the human and the animal body.

It is stated that true *B. coli* can be fairly readily differentiated from the other members of the coli group by the type of its colony on eosin-methylene-blue lactose agar plate. Comparative tests of *B. coli* strains failed to yield

any criterion for the differentiation of *B. coli* of human origin from that of animal origin. Under natural conditions the pollution of water by *B. coli* originating from the feces of animals such as fishes, frogs, and insects is considered unlikely.

Stream pollution (*Amer. Soc. Civ. Engin. Proc., 51 (1925), No. 9, [pt. 3], pp. 1809–1855, figs. 13*).—This is a symposium containing the following special articles: A Review of the Work of the United States Public Health Service in Investigations of Stream Pollution, by W. H. Frost (pp. 1810–1818); The Rate of Deoxygenation of Polluted Waters, by E. J. Theriault (pp. 1819–1828); The Rate of Atmospheric Reaeration of Sewage Polluted Streams, by H. W. Streeter (pp. 1829–1842); and Quantitative Studies of Bacterial Pollution and Natural Purification in the Ohio and the Illinois Rivers, by J. K. Hoskins (pp. 1843–1855).

RURAL ECONOMICS AND SOCIOLOGY

An economic study of the agriculture of the Connecticut Valley, I, F. V. Waugh (*Connecticut Storrs Sta. Bul. 134 (1925), pp. 383–403, figs. 12*).—Statistical material setting forth the production, supply, and consumption of Connecticut Valley tobacco has been compiled from reports of several of the Federal Departments and tabulated in this, which is the first one of a series of reports that will deal with various phases of the Connecticut Valley agriculture. The trend of cigar production and consumption, the production of other manufactured tobacco and of cigar leaf tobacco, and the increase of cigar leaf tobacco stocks are discussed and presented graphically. The facts indicate the existence of a serious economic situation and a need for immediate readjustment in this industry.

Land settlement for disabled ex-service men, P. A. M'William (*Scot. Jour. Agr., 8 (1925), No. 4, pp. 420–423*).—A brief account is given of the operation of a 300-acre farm just outside the city limits of Edinburgh, Scotland, which since 1922 has been conducted as a land-settlement scheme for disabled ex-service men.

The trend of real estate taxation in Kansas from 1910 to 1923, E. Englund (*Kansas Sta. Bul. 235 (1925), pp. 3–97, figs. 28*).—The purpose of the investigation reported upon here was to show the trend of taxes on farm and city real estate and to measure the causes of the increase in the tax burden on each. An effort was made to determine to what extent the increase in real-estate taxes was caused by higher levies for the State and for its subdivisions, and to what extent it was due to increased expenditures for public purposes. The primary basis for comparing the real-estate levy of each year with the levies of a base period was the relation of the tax levy to the selling value of the property taxed. All comparisons are based on 1910–1914 averages, with the exception that data showing the extent to which each public purpose is responsible for the increase in real-estate taxes are based on 1916–1918 averages. The principal data presented here have been tabulated for each of five principal agricultural sections of the State, the wheat belt being subdivided into two parts, and for the State as a whole. The three principal parts of the report deal with the trend of taxes on farm real estate, on city real estate, and the two compared.

The ratio of taxes to selling value of city real estate was more than twice as high as in the case of farm real estate in the period under study. The rate of increase of this ratio was greater in city real estate. The differences are said to be not as disadvantageous to the latter as it might seem, due to the greater possibility of shifting taxes on city real estate, services rendered by

municipal governments and the effect of these on rents and real estate values, and the probability that the owner of city real estate has more taxable capacity than the farmer, in addition to that which is represented by the ownership of real estate.

Report upon large scale co-operative marketing in the United States of America, R. B. FORRESTER (*[Gt. Brit.] Min. Agr. and Fisheries, Econ. Ser. 4 (1925), pp. VIII+192, pls. 2, figs. 15*).—This is a review of the main principles involved in the cooperative marketing of agricultural produce in the United States and the chief lines along which development is proceeding. Two types of cooperative marketing associations, the federated and the central, are described. The report is devoted principally, however, to setting forth the organization and operation of the latter type. This study comprises No. 4 of a series of reports on economic subjects connected with agriculture previously noted (E. S. R., 54, p. 184).

Report on the co-operative purchase of agricultural requisites (*[Gt. Brit.] Min. Agr. and Fisheries, Econ. Ser. 5 (1925), pp. III+110, pls. 3*).—This one of the series noted above is a continuation of the report dealing with cooperative marketing in England and Wales (E. S. R., 54, p. 32). It presents a detailed account of the extent to which farmers have combined for organized purchase, discussing the administration, trading policy, finances, and other business aspects of societies.

American fruit and produce auctions, A. D. MILLER and C. W. HAUCK (*U. S. Dept. Agr. Bul. 1362 (1925), pp. 36, figs. 12*).—An investigation of this method of selling is discussed under the main heads of development, the ownership and control of auction companies, the position of auctions in channels of distribution, the extent and growth of the auction business, commodities sold at auction, sources of supply, how the goods are handled and sold, auction sales of bananas, charges, free on board telegraphic auctions, and essential points of auction law.

There are now 24 companies engaged in selling fruits and produce at auction in the United States. These operate in 14 of the principal distributing centers, all but one of which are located in the northeastern section of the country. A tendency toward greater uniformity in methods and practices is noted. The delivered auction, in which sales are made only after arrival of the goods, occupies a position in the channels of distribution between the shipper and the retailer. Its functions are identical with those of the car lot wholesaler or the commission merchant, yet it operates in much the same manner as the jobber and other less-than-car-lot wholesalers, serving both groups. A great variety of commodities are sold at auction, but they are mainly citrus and deciduous fruits. The salaried city representatives of large cooperative and private marketing exchanges and the auction receivers furnish approximately four-fifths of the supplies sold at auction. Charges and commission rates assessed lack uniformity, but in most cases are less than the cost of selling by private sale.

A bibliography of 44 titles is appended.

Thirty-sixth annual wool review, WINCHCOMBE, CARSON, LTD. (*Sydney: [Authors], 1925, pp. 32*).—A summary of the Australian wool situation and the disposal of the 1924 clip (E. S. R., 52, p. 394).

Crops and markets, [December, 1925] (*U. S. Dept. Agr., Crops and Markets, 4 (1925), Nos. 23, pp. 353–368; 24, pp. 369–384; 25, pp. 385–400; 26, pp. 401–416*).—An abstract is given in each of these numbers of the week's markets for important classes of agricultural products, and special articles, with tabulations, appear reviewing in more detail trading and prices received. Notes are offered on the foreign crops and markets situation.

Monthly Supplement to Crops and Markets, [December, 1925] (*U. S. Dept. Agr., Crops and Markets, 2 (1925), Sup. 12, pp. 377-432, figs. 4*).—The usual tables are given in this number showing the acreage, yield per acre, production, farm price December 1, total farm value, and value per acre, by States, of the cereal grains, forage crops, fruits and vegetables, tobacco, cotton, and truck crops. In addition there are the returns from the December 1 pig survey for the Corn Belt States; tabulated index numbers of the total and per capita mass of crop production, 1890-1912; corn and hog ratios; and reports on livestock and dairy products markets, cold storage holdings, and shipments of fruits and vegetables. Brief notes review the sorgo seed production by principal producing States in 1925, world agricultural conditions November 15 to December 15, and the price situation in November. Monthly average prices for many products for periods of years are also shown.

Description and travel as source material for the history of early agriculture in Pennsylvania, R. W. Kelsey (*Amer. Hist. Assoc. Ann. Rpt. 1920, pp. 283-292*).—The author shows the value and availability of description and travel accounts as source material, particularly with reference to soil improvement and wages and wheat prices. He analyzes a travel journal kept by an early American in a journey across New Jersey and Pennsylvania in 1794 to show the amount and kind of information furnished.

The early development of agricultural societies in the United States, R. H. True (*Amer. Hist. Assoc. Ann. Rpt. 1920, pp. 293-306*).—Organizations intended to promote the movement for agricultural improvement were formed both in Europe and in America. Early in the eighteenth century efforts to widen the circle of influence of these societies included the publishing of memoirs and transactions and the offering of premiums for solutions to problems. Exhibits were arranged at which products were put in competition for prizes, and agricultural fairs were developed.

Agrarian discontent in the South: 1880–1900, B. B. Kendrick (*Amer. Hist. Assoc. Ann. Rpt. 1920, pp. 265-272*).—The low social status of the southern farmer in 1890 relative to his high position in 1860 was the result of the economic revolution attendant upon loss of stock and equipment and the demoralization of the labor supply during the war and in reconstruction years. Lien laws were passed ostensibly in the interest of the landlords but proved to be detrimental.

History of the ranch cattle industry in Oklahoma, E. E. Dale (*Amer. Hist. Assoc. Ann. Rpt. 1920, pp. 307-322*).—This paper deals historically with cattle raising from the beginning of ranching in Oklahoma upon a large scale to statehood in 1907.

First report of the Royal Commission on Food Prices, with minutes of evidence and appendices, I–III, A. C. Geddes et al. (*London: Govt., 1925, vols. 1, pp. VIII+207, pls. 3; 2, pp. VIII+387; 3, pp. VIII+226, pls. 17*).—The commission, appointed November 29, 1924, "to inquire into the conditions prevailing in the wholesale and retail trades in articles of food of general consumption so far as they affect prices, particularly having regard to the difference between the prices received by producers and the prices paid by consumers and to report what action, if any, can usefully be taken," makes its report in three volumes. The first volume furnishes a general introduction to the subject matter of the inquiry, a general explanation of the causes of the present level of food prices, and certain statistical evidence bearing on the margin between wholesale and retail prices. The bread, flour, and wheat and the meat trades are reviewed. The question of State trading in food is raised, and the constitution, duties, and powers of a proposed food

council are sketched. Volume 2 presents the oral evidence submitted in 19 days of hearings before this commission which was given by statistical experts, who set forth the general course of food prices and the computation and use of index numbers; an officer of the Ministry of Agriculture, who summarized the recommendations of the departmental committee (E. S. R., 52, p. 693); witnesses representing the meat, wheat, flour, and bread trades and cooperative societies; specialists familiar with costs of production; housewives; and others. Volume 3 contains statements of the evidence submitted.

Why your food costs more (*London: Sci. Press, Ltd., 1925, pp. 77*).—Extracts from the evidence of housewives and points from the findings and recommendations of the commission noted above are presented.

American rural standards, T. S. McMahon (In *Social and Economic Standards of Living. Boston and London: D. C. Heath & Co., 1925, pp. 215–241*).—Rural populations are said to be composed of a number of distinct national groups, and rural immigrant communities particularly retain social and racial differences at least a generation longer than do urban immigrant centers. Frugality is demanded by the fact that very little first-grade land is within reach of immigrants. Isolation and segregation have influenced the persistence of types of social institutions in rural sections among native as well as immigrant groups.

The social gap between country and city, however, promises to be bridged through the adoption of uniform standards of living as a result of propaganda introducing higher standards of comfort.

The social survey in town and country areas, H. N. Morse (*New York: George H. Doran Co., 1924, pp. XV+13–134, figs. 22*).—A statistical and graphic summary of data assembled in the town and country surveys previously noted (E. S. R., 48, p. 493) constitutes the final volume of the series. Part 1 presents selected statistical material, while part 2 gives an analysis of the aim and method of the social survey as related particularly to religious interests and to the work of the town and country church.

Social organizations working with rural people, W. A. Terpenning (*Kalamazoo, Mich.: Ext. Dept., West. State Norm. School, 1925, pp. 125, figs. 12*).—A study was made of the work of all the important social organizations in Hillsdale and Lapeer Counties, Mich. Chapter 1 of this discussion sets forth the rural social needs which are not met without cooperative effort. Chapter 2 is an attempt to measure the success of the various organizations in meeting those needs. Chapter 3 is a criticism based upon the author's observation of the activities of specific agencies in the counties studied, and chapter 4 offers some tentative suggestions as to methods of improving rural social organization.

In the two counties studied the usual county and farmers' organizations were not meeting the needs of the communities. Greater correlation is held to be desirable. The principal weakness of both the leaders and followers is a lack of appreciation of the organic view.

A new day for the country church, R. Harlan (*Nashville, Tenn.: Cokesbury Press, 1925, pp. VIII+166*).—This is designed as a short manual for use in courses for pastors of country churches. It includes also material intended to awaken general interest in the country church. Some of the functions and opportunities for service of the rural minister, purposes and methods of evangelism, objectives and a program of activities, and administration, organization, and finances of the country church are discussed. Concluding chapters deal with the relation of the country church to world problems, Christian leadership, and the country life movement in America.

AGRICULTURAL AND HOME ECONOMICS EDUCATION

Agricultural education, G. A. WORKS (*U. S. Bur. Ed. Bul. 32 (1925), pp. 11*).—This advance sheet from the Biennial Survey of Education in the United States, 1922–1924, points out some of the indications that the movement in recent years has been away from the vocational objective in instruction in agriculture in the elementary schools. It presents furthermore some of the objectives of boys' and girls' club work in connection with the teaching of agriculture and home economics to children in the elementary school period.

Instruction in vocational agriculture as a part of the program of secondary education is said to be developing in departments of comprehensive high schools and in special schools of agriculture. The decline of recent years in the enrollment in agriculture at the agricultural colleges is noted. However, evidences of interest in a more scientific determination of objectives in this field are pointed out.

[**Agricultural education and research in Great Britain**], A. D. HALL (*[Gt. Brit.] Min. Agr. and Fisheries, Intel. Dept. Rpt. 1921–1924, pp. 4–121*).—This is a report upon the development of the policy pursued by the Ministry of Agriculture for Great Britain with regard to agricultural education and research in the years 1921–1924. It sets forth the organization and projects under way at the research institutes, and describes the advisory and local investigation service and higher agricultural education, scholarships, and the training of ex-officers and men in agriculture and other branches of the work.

The rural school and the agricultural profession, M. T. LAURIN (*L'École Rurale et la Profession Agricole. Paris: Biblioth. Éducation, 1925, pp. 236*).—The author here endeavors to show what education is needed among the agricultural peasants in France and how the rural schools should be organized to function in meeting the agrarian crisis and in contributing to the civic well-being of the rural population.

A laboratory guide for a course in general botany, L. BONAR, R. M. HOLMAN, and L. ROUSH (*New York: John Wiley & Sons; London: Chapman & Hall, 1925, pp. XVI+106*).—Laboratory directions designed for a year's college elementary course are presented here. Part 1 covers the structure and functions of seed-bearing plants; part 2, types of the principal groups of plants. A classified list of books for reference and collateral reading is given.

FOODS—HUMAN NUTRITION

Potatoes from the housekeeper's standpoint, N. E. GOLDTHWAITE (*Colorado Sta. Bul. 297 (1925), pp. 32, figs. 5*).—Part 1 of this publication deals with the structure and composition of the potato, with references to Bulletin 296 noted elsewhere in this issue, and part 2 with the general principles involved in cooking potatoes by boiling, steaming, baking, and frying, and in recooking leftover potatoes. An appendix dealing with the composition of the earth, the human body, and food, and a glossary of terms are included.

The use of preserved olives as food [trans. title], T. STATHOPOULO (*Jour. Pharm. et Chim., 8. ser., 2 (1925), No. 7, pp. 280–285*).—This is a general discussion of the preparation of ripe olives in Greece and their use as an important article of food. Analyses of several varieties are included.

The basal metabolism of some Orientals, G. MACLEOD, E. E. CROFTS, and F. G. BENEDICT (*Amer. Jour. Physiol., 73 (1925), No. 2, pp. 449–462*).—The literature on the metabolism of Orientals is reviewed and discussed, and an extensive investigation is reported of the basal metabolism of 7 Chinese and 2

Japanese women from 21 to 29 years of age who had been in the United States for from 15 to 52 months and were leading the usual life of American college students. The experiments were made during the winter months, and included in addition to the basal metabolism as computed from the measured oxygen consumption per minute records for age, height, weight, sitting height, surface area, pulse rate, respiration rate, and vital capacity, and in 3 cases blood pressure. The principal findings were as follows:

The average body weight of the 9 students was 47.2 kg. and the average height 155 cm., as compared with the average weight of 56.5 kg. and height of 162 cm. for 103 American women students reported by Harris and Benedict (E. S. R., 41, p. 700). Corresponding averages for a group of 43 women from 20 to 30 years of age, studied at Teachers College, Columbia University, were 57.2 kg. and 163 cm. The average pelidisi of the present group was 92 as compared with 95 for the Teachers College group. Surface areas as calculated from the Du Bois weight-height chart averaged 1.44 square meters. In the case of 3 subjects whose surface areas were determined from actual measurements, the results were uniformly about 3 per cent higher than the estimated areas.

The vital capacity was low, averaging 14.3 cc. per centimeter of height and 1.54 liters per square meter of surface area. The minimum, maximum, and average pulse rates were 54, 64, and 60 beats per minute, values which are below the minimum values for normal American women. The respiration rate varied from 9 to 18 respirations per minute, with an average of 14. The systolic blood pressures in the 3 cases examined were 98, 103, and 102 mm., respectively.

The oxygen consumption varied from 146 to 187 cc. per minute, and the total 24-hour heat produced, compiled from these figures, from 1,014 to 1,299 calories, with an average of 1,147 calories. Corresponding figures for the two groups with which comparisons of other values have been made are 1,349 and 1,315 calories, respectively. The basal metabolism figures averaged 10.4 per cent below the Harris-Benedict prediction standard and 10.2 per cent below the Aub and Du Bois standard.

In commenting upon these results, the authors state "since there was nothing in the physiological measurements of these young women to indicate abnormality, we are forced to the conviction that we are dealing with a specifically low cell metabolism characteristic of the Orientals, and that American and English physiological standards may not be applied to Orientals, particularly in pathological cases. Judging from the scattered reports of observations of basal metabolism in the Orient, we believe that our data show that transplanted Orientals retain their inherited low metabolism.

"An examination of data obtained in our several laboratories (but not here published) and data published elsewhere on normal women leads us to the belief that the present standards for American women are too high, indeed, approximately 5 per cent too high. Consequently those who adhere to a standard of plus or minus 10 per cent as an index of normality may have to realize that the metabolism of all women found to be between +5 and +10 per cent of the present-day standards is really between 10 and 15 per cent above the true normal.

"The standards for basal metabolism have already, by common consent, been modified for the effects of sex and age. It is now suggested that the correction for difference in sex be increased, and that a racial effect in the direction of a lower metabolism be recognized with the Chinese and Japanese."

The relation of vitamin A to growth, reproduction, and longevity, H. C. Sherman and F. L. MacLeod (*Jour. Amer. Chem. Soc., 47 (1925), No. 6, pp.*

1658–1662, fig. 1).—Further evidence of the importance of vitamin A in nutrition is afforded by this study in which 17 female and 5 male rats were continued until natural death on each of two types of diets, differing only with respect to their content of vitamin A. The diets consisted of ground whole wheat supplemented by skim milk or whole milk powder in one series and by skim milk powder with butterfat or either coconut fat or lard in the other. The vitamin A content of the diets richer in this vitamin was estimated to be about seven times as high as that of the diets containing skim milk with or without lard or coconut fat.

The animals on the diets containing the smaller amount of vitamin A grew to nearly normal adult size, but lived only about half as long as those on the richer diet. Only 31 young were born and none lived over 2 days. On the richer diet the animals grew to average size, reproduced successfully (a total of 477 young), and lived to an age of 746 days as compared with 369 for the other group.

It is considered of significance that the animals on the diet furnishing less vitamin A proved very susceptible to infection, particularly lung disease at an age corresponding to that at which pulmonary disease often develops in young people. "Thus it is clearly shown that vitamin A is an even more important factor in the chemistry of food and nutrition than has previously been appreciated, for it must be supplied in liberal proportion not only during growth but in the food of the adult as well, if a good condition of nutrition and a high degree of health and vigor are to be maintained."

Fat-soluble vitamins.—XXIII, The induction of growth-promoting and calcifying properties in fats and their unsaponifiable constituents by exposure to light, H. STEENBOCK, A. BLACK, ET AL. (*Jour. Biol. Chem., 64* (*1925*), *No. 2, pp. 263–298, figs. 6*).—In this continuation of the investigation previously noted (E. S. R., 53, p. 264), the problem of the antirachitic activation of foods by ultra-violet irradiation was subjected to an exhaustive study which is reported in three parts as follows:

I. *Experiments with irradiated fat on growing rats.*—The effect of irradiation on food materials with respect to the antirachitic factor was tested by the growth behavior of rats which had been reared with low reserves of the antirachitic factor and placed for the experiment on a basal diet of purified casein 18, salt mixture 4, yeast 8, agar 2, and dextrinized cornstarch 68 parts, to which the materials to be tested were added in the proportion of 2 parts for every 98 of the food mixture. A quartz mercury vapor lamp of the Cooper-Hewitt BY type run at 40 volts and 4.5 amperes was used as the source of light, and the materials were exposed in 100-cc. quantities in 8 by 10 in. glass dishes at a distance of 22 in. with frequent stirring for varying periods of time.

Inactive lard and olive oil became activated on exposure for 30 minutes as shown by renewed growth of the experimental animals. Cod-liver oil irradiated for 17 and olive oil irradiated for 10 and 17 hours became inactivated. Activated olive oil retained its activity after standing for from 5 to 6 weeks in a stoppered flask in a dark place. The activity of the artificially activated olive oil was not destroyed by saponification. Irradiated olive oil and lard proved incapable of giving off radiations to rats exposed to them in small cages. The unsaponifiable constituents of olive oil became activated on irradiation. Inactive cholesterol prepared from pigs' brains was activated by irradiation in ether solution in a quartz flask.

II. *Experiments with irradiated and nonirradiated fats on rachitic rats.*—In the studies reported in this part, antirachitic activation was tested by the line test of McCollum and coworkers (E. S. R., 47, p. 566). After a number of trials of basal diets, the one selected as providing sufficient vitamin A

without the antirachitic factor and being most satisfactory in every respect consisted of yellow corn 76, wheat gluten 20, calcium carbonate 3, and sodium chloride 1 part.

Preliminary tests with commercial cod-liver oil showed that at a level of 2 per cent of the basal ration a positive line test was not obtained until the end of the fifth day and at 10 per cent at the end of the second day. This is thought to indicate that a comparatively low level of the antirachitic factor over a longer period of time is better than a high level over a shorter period. Consequently a period of from 7 to 11 days on the test ration was adopted as the most satisfactory. Tests with varying amounts of irradiated olive oil showed 0.2 per cent to be about the minimum amount giving positive results in the line test in 9 days. Irradiated olive oil kept in a dark, stoppered bottle for 10 months was practically as active as when first irradiated, but another sample exposed in a beaker covered with a watch glass became entirely inactive in 9 months.

Tests with different sources of light for activation indicated that varied sources can be used, but that the carbon and iron arcs are not as effective as the mercury arcs. Tests with different filters similar to those reported by Hess and Weinstock (E. S. R., 49, p. 365) showed Corning glass filters G-385-DP, G-38-H, and G-586-A, window glass, and plate glass to be impenetrable to the active rays and thin (1.5 mm.) pyrex glass and water to be penetrable. The results with water are thought to confirm the suggestion previously made by various workers that the origin of the antirachitic factor in fish livers is its synthesis by the action of sunlight on plankton in shallow water.

In attempts to activate other fats variable results were obtained with coconut and corn oils, apparently due to the state of freshness. Freshly prepared coconut oil was inactive but was readily activated on irradiation. The antirachitic properties attributed by various workers to commercial coconut oil are thought to be due to exposure of the copra to sunlight. Old oleo oil, peanut oil, and cottonseed oil, all of which were acid in reaction, could not be activated.

III. *Experiments with irradiated and nonirradiated unsaponifiable constituents on rachitic rats.*—The results reported in part 1 as determined by growth are confirmed by data obtained by the line test as a criterion, and further data are reported in an attempt to determine the nature of the compounds which can be activated. In the latter highly purified and activated cholesterol was treated with benzoic acid and the resulting benzoate found to be inactive. The cholesterol separated from the benzoate was also inactive but could be activated by irradiation. Cholesterol activated in crystal form instead of ether solution proved particularly stable to prolonged irradiation. Olive oil with the addition of sufficient oleic acid to give an acidity equal to that of old coconut oil could be activated on irradiation. This is thought to prove that the failure of activation of old oils is not due to an inhibition of the reaction by compounds formed on standing.

Fat-soluble vitamins.—XXIV, The non-precipitability of the antiophthalmic and antirachitic properties from cod liver oil by digitonin, E. M. Nelson and H. Steenbock, (*Jour. Biol. Chem.*, *64* (*1925*), *No. 2*, *pp. 299–312*, *figs. 2*).—Continuing the above investigation cholesterol was removed from the nonsaponifiable fraction of cod-liver oil by precipitation by digitonin, and the resulting cholesterol-free extracts were tested for the antirachitic factor by growth experiments and by the calcification of rachitic lesions and for vitamin A by the prevention and cure of ophthalmia.

In all cases the extracts freed from substances precipitable by digitonin retained their antiophthalmic and antirachitic properties. In further tests a

petroleum ether solution of the unsaponifiable constituents of cod-liver oil was found to retain its antiophthalmic and antirachitic potency after standing for a year and a half in the laboratory. The cholesterol removed from cod-liver oil was inactive but could be made active by irradiation.

Fat-soluble vitamins.—XXV, **Further observations on the anti-rachitic action of irradiated animals on the non-irradiated when placed in the same cage,** E. M. NELSON and H. STEENBOCK (*Amer. Jour. Physiol., 73 (1925), No. 2, pp. 341–345, fig. 1*).—*In this continuation of the series noted above,* nonirradiated and irradiated rats, all on a standard rickets-producing diet, were kept in close proximity but without actual contact in two-section wire cages, the upper section separated from the lower by wire screening only. When the irradiated animals were kept in the upper section the nonirradiated animals in the lower section did not develop rickets, but when the nonirradiated animals occupied the upper section they promptly developed rickets.

This is thought not only to demonstrate that irradiated animals do not give off radiations capable of exerting an antirachitic effect upon neighboring nonirradiated animals, but to give further proof of the conclusion drawn by the authors in a previous paper of the series (E. S. R., 53, p. 264) that contamination of the screens of the cages in which irradiated animals are kept is responsible for the apparent favorable action of irradiated upon nonirradiated animals. In the present instance the activating effect is attributed to the consumption by the rats in the lower cage of minute traces of excreta adhering to the screens as they drop through to the bottom of the cage.

Relation of tryptophan to thyroid activity in the white rat, H. C. CHANG (*Amer. Jour. Physiol., 73 (1925), No. 2, pp. 275–286, figs. 4*).—The possibility that tryptophane may be the precursor of thyroxin was tested by observations of the effect upon the general condition, body weight, and weight of the thyroids of white rats fed various diets supplemented in some cases by subcutaneous injections of tryptophane. The diets used included a control diet of bread and milk, a chronic inanition diet of bread and milk in insufficient amounts, a quantitative maintenance diet of milk and flour, an aciduric diet of bread and milk plus about 1 gm. of lactose per capita, a qualitatively insufficient diet of gelatin, starch, lactose, butterfat, salts, and water, and the last-named diet plus vitamin B tablets. The tryptophane was used in 1 per cent solution for injection.

On the bread and milk and bread-milk-lactose diets subcutaneous injections of tryptophane amounting to from 0.4 to 0.7 gm. during periods of from 22 to as high as 111 days did not produce any demonstrable changes in the morphology of the thyroid glands over those of the controls. The rats on the gelatin diet and on the quantitatively insufficient diet lost weight and developed a hypo condition of the thyroid. Vitamin B did not improve the nutritive condition of the animals on the gelatin diet, but the subcutaneous injection of a total amount of 0.549 gm. of tryptophane during a period of 31 days caused an improvement in general condition and a normal appearance of the thyroid gland. On the maintenance diet the injection of a total amount of 0.295 gm. of tryptophane for a period of 54 days did not accelerate the rate of growth. The weights of the thyroids with the parathyroids were in most cases proportional to the body weight irrespective of the diet.

The author is of the opinion that while lack of tryptophane may affect the thyroid by lack of material for production of the thyroid hormone, the general nutritive condition is the more important factor responsible for the thyroid changes.

Tryptophan and thyroid function, A. R. ABEL, R. W. BACKUS, H. BOURQUIN, and R. W. GERARD (*Amer. Jour. Physiol., 73 (1925), No. 2, pp. 287–295, figs. 2*).—

In this investigation of the possible need of the thyroid gland for tryptophane, white rats were fed diets similar except for their content of tryptophane, thyroxin, and protein, and records were kept of the weight and general appearance of each of the animals until it died or was killed, when post-mortem examinations were made of the thyroid glands. The essential differences in the diets were (1) protein almost entirely as casein, (2) protein as zein and gelatin, with added tryptophane, (3) as zein and gelatin, with no added tryptophane or thyroxin, and (4) as zein and gelatin, with added thyroxin.

On the casein diet the animals appeared normal, and the condition of the organs on autopsy was normal. On the tryptophane-free diet definite clinical symptoms leading to death developed in from 1 to 6 weeks, depending upon the weight at the beginning of the experiment. The thyroid glands showed a slightly increased cellularity. On changing from the tryptophane-free to a tryptophane-containing diet immediately upon the development of symptoms, there was no relief from the general symptoms, but the thyroids were normal in appearance. The administration of thyroxin in the place of tryptophane after the development of symptoms also brought no relief to the general symptoms, but appeared in some cases to make the thyroid glands more or less colloidal. The administration of thyroxin from the start rendered the thyroid colloid and atrophic and prevented the symptoms resulting from the tryptophane-free diet but did not prevent emaciation and death.

"These facts indicate that tryptophane is essential to the normal functioning of the thyroid; a large amount of the needed tryptophane is available for the thyroid from the tissues of the body; the thyroid is able to take up tryptophane from the blood in quantities approximating its needs, even when the total amount is so small that other tissues suffer from its lack; sufficient thyroxin from an outside source induces atrophy of the thyroid. Lack of tryptophane results also in extrathyroid disturbances leading to emaciation and death."

Rickets in infants.—Treatment with irradiated milk, B. KRAMER (*Amer. Jour. Diseases Children, 30 (1925), No. 2, pp. 195–198, figs. 2*).—In this investigation of the value of irradiated milk in the treatment of rickets, 8 rachitic children from 5 to 39 months of age, 5 of whom were suffering from a severe form of the disease and 1 from active and 1 latent tetany, were placed on a diet of irradiated milk, orange juice, and cereal, and the progress of the disease was compared with that of 2 other rachitic children whose diet differed from the first group only that nonirradiated milk was used in place of irradiated.

At the beginning of the experiment the calcium content of the blood of all but 2 of the children in the first group and the 2 controls was about normal and the phosphorus content low. Following the treatment with irradiated milk there was a gradual rise in the level of inorganic phosphorus to normal values in about 4 weeks, but there was no appreciable change on the nonirradiated milk. Röntgenograms showed early but definite signs of healing by the end of the third week in the subjects of the first group and no change in the second. Determinations of the calcium and phosphorus balances in 2 of the children during a preliminary 4-day period and after 2 weeks of treatment with irradiated milk showed marked increase in the retention of calcium and phosphorus during the period of treatment.

TEXTILES AND CLOTHING

Measuring luster of fabrics, H. SCHULTZ, trans. by I. GINSBERG (*Textile World, 66 (1924), No. 12, pp. 61, 63, figs. 3*).—This contribution from the

laboratory of C. P. Goerz at Friedenau near Berlin defines luster and discusses its measurement in fabrics by the Goerz luster meter and by the Douglas method. Luster is affected by surface conditions, the wave length of light striking the substance, and by the absorption of light.

Some common faults in cotton goods, F. SUMMERS (*Jour. Textile Inst., 16 (1925), No. 11, pp. T323–T337, figs. 5*).—The irregular character of raw cotton is illustrated and briefly discussed in an endeavor to show that defects in cotton goods sometimes may be due to factors beyond control during spinning and manufacture. The faults described are neps, yarn discolorations, barring due to irregularity and to mechanical faults, and faults produced during mercerization.

Mercerization of cotton with nitric acid [trans. title], P. P. BUDNIKOFF (*Melliand's Textilber., 6 (1925), No. 9, pp. 661, 662*).—Experiments at the Textile Industry Dye Laboratory in Łódź showed that treatment with nitric acid improves the general characteristics of cotton fabrics and yarns and significantly enhances the dyeing quality of the fiber.

The cotton fibers were shortened by about 10 per cent, but the strength was increased about 20 per cent. The optimum temperature for the treatment seemed to be from 15 to 28° C. (59 to 82.4° F.) and the best concentration of nitric acid 40–41° B. The duration of the process varies widely, depending on the character of the dye, ranging between 30 seconds and 21 hours. The affinity of the fiber for a dyestuff appeared to increase progressively up to a certain point (up to 12 hours), depending on the duration of the nitric acid treatment, after which a progressive decline begins.

A survey of the silk industry of central China (*Shanghai: Shanghai Internatl. Testing House, U. S. Testing Co., 1925, pp. [2]+100, pls. 2, figs. 9*).—A general description of the silk industry in central China is presented, with chapters on the status of silk production in the several districts. Pertinent statistical data are appended.

The practice and ethics of silk weighting (*Jour. Textile Inst., 16 (1925), No. 11, pp. P327–P334*).—This lecture includes a discussion of the merits of the practice by F. Farrell and an historical acconnt by F. Warner.

Artificial silk (*Manchester Guardian Com., 1925, Mar. 5, pp. 15–64, figs. 64*).—Among the articles included in this special number are the following: The Reputation of Artificial Silk, by S. Courtauld; History of the Artificial Silk Industry, by C. F. Cross; The Viscose Process—I, Raw Material, Outline of Process, Machinery, by H. Hegan, II, The Preparation and Weaving of Viscose Yarns, by T. Brough, III, Problems of Winding and Finishing, by E. Smith, IV, The Printing of Artificial Silk Fabrics, by J. R. Hannay, and V, How Viscose Yarn is Dyed, by C. M. Whittaker; The Cellulose Acetate Process, by P. E. King; The Cuprammonium Process; The Chardonnet Process, by C. Charlier; The Uses of Artificial Silk—I, As a Woven Fabric, by T. Brough, and II, As a Knitted Fabric, by W. Davis; Artificial Silk Production in Germany, by O. Herzog; German Progress in the Utilisation of Artificial Silk, by H. Jentgen; and The Apparatns of Artificial Silk Production, by A. G. Perl.

Tests on rayons for breaking strength and stretch under varying humidities, W. A. GOSS (*Cotton, 90 (1925), No. 2, pp. 119, 120*).—Breaking and stretch tests were made on samples of rayon yarn at 70° F. and under 45, 55, 65, 75, and 85 per cent relative humidity at the Bradford Durfee Textile School, Fall River, Mass.

In 98 per cent of the tests the break was lower as the relative humidity became higher, but the percentage of stretch at the rupture point increased. The curve also showed a decrease in break at the higher humidities at the 45° point, although the percentage of stretch was much more uniform than

at the rupture point. It appeared that the yarn with the least percentage of stretch would have no tendency to lose its diameter. The point where the curve changes from 45 to 90° should be considered the best place to check the break and stretch, as from here the diameter changes and the results in the cloth, using yarn under this tension, would be detrimental to first quality goods. A minimum amount of moisture in the room appeared proper for best results.

Successful methods for handling rayon, A. H. GRIMSHAW (*Textile World, 68 (1925), Nos. 17, pp. 53, 55, 73; 20, pp. 53, 55*).—This contribution from the North Carolina State College gives the essentials of methods which have proved satisfactory for twisting, reeling, lacing, oiling, winding, warping, skein sizing, machine sizing, weaving, knitting, humidifying, scouring, bleaching, and dyeing of rayon. Conclusions are drawn from observations among mills using rayon and from experiments at the New Bedford Textile School.

This rayon—can it be laundered safely? E. L. MILLIKEN (*Starchroom Laundry Jour., 32 (1925), No. 11, pp. 128, 130, 132, 134*).—The properties of rayon are indicated, and methods considered best in laundering and cleaning rayon fabrics are outlined, with a summary report of laundering tests.

Rayon used as fill in shirtings, dress goods, and draperies apparently suffered no greater percentage loss in strength in the first washing than did cotton warp used in the same fabrics; practically no further appreciable loss resulted through 20 washings and ironings. In tests held rather inconclusive, rayon used in the warp for linings with a cotton fill showed a slightly greater percentage loss in strength than the cotton fill. Knit goods of all rayon used for hosiery and underwear gained somewhat in strength, the gain being largest in the first washing and decreasing slightly after 20 washings and ironings but in general not to below its original strength.

Colored goods and the laundry, G. H. JOHNSON (*Amer. Dyestuff Rptr., Sample Swatch Quart., 1925, Oct., pp. 682–685, 709, figs. 3*).—Laundering methods used when handling colored goods in the well-conducted commercial laundry are described, with formulas recommended for colored cotton shirts, knit underwear, woolens, silks, overalls, hosiery, colored curtains, and cotton fugitives.

The control of laundry operations, R. G. PARKER (*London: Brit. Launderers' Research Assoc., 1925, pp. XII+245, figs. [53]*).—This manual on the scientific principles of laundry processes is essentially a summary of research reports of the British launderers' Research Association. While designed for the use of commercial laundries, it contains much information of value in home laundering, particularly in the chapters on water, soaps, and other detergents, starch, factors affecting the washing of cotton and linen goods, woolens, and stains and their removal.

Blood stains and different methods of removing from various fabrics, L. E. FOSTER (*Natl. Cleaner and Dyer, 17 (1926), No. 1, pp. 97, 98*).—Several methods are outlined for the removal of blood from silk and wool fabrics.

Historic costume, K. M. LESTER (*Peoria, Ill.: Manual Arts Press, 1925, pp. 224, pl. 1, figs. 94*).—A brief history of costume design from the earliest times to the present, with emphasis on French fashions from the beginning of the Renaissance to the development of American costume at the beginning of the nineteenth century. Numerous sketches of typical costumes are given throughout the volume.

NOTES

Florida University and Station.—Dr. C. V. Noble, assistant professor of farm management at Cornell University, has been appointed to head the station department of agricultural economics. He will be assisted by Bruce McKinley, assistant agricultural economist, and H. G. Hamilton, instructor in farm management in the College of Agriculture, who has been appointed assistant in the department.

Michigan College and Station.—The new horticultural building was dedicated February 4. The speakers included former Director C. G. Woodbury of the Purdue Station, Dr. L. H. Bailey, President K. L. Butterfield, V. R. Gardner, Dean F. B. Mumford of Missouri, and F. A. Waugh of Massachusetts.

Since January 1, the college has obtained 345 acres of additional land adjoining the college farm, 115 acres by purchase and the remainder by lease subject to purchase. The landholdings of the college at East Lansing now aggregate 1,593 acres.

The college is soon to build a new horse barn as the first of an entire new group of farm buildings to be located south of the Red Cedar River. The present buildings are inadequate for present needs and are so located as to be in the way of new academic buildings.

The station has accepted an offer of the U. S. D. A. Bureau of Entomology to cooperate in a project in Monroe County to investigate means of control of the European corn borer. The proposed State allowance for the fiscal year 1926–27 for this work is about $6,000.

Two new fellowships have been established at the college, the first by the National Fertilizer Association to study the effects of fertilizers in the chemical composition of crops, especially from the mineral standpoint, and the second by the Chilean Nitrate Educational Bureau to determine the effects of nitrate of soda on sugar beets when grown on different soil types. The first-named project will be under the direction of the chemistry and soils departments of the station, but closely correlated with the cooperative project of the dairy section entitled A Study of Depraved Appetite in Dairy Calves. M. F. Mason has been assigned to this project and James Tyson to the fellowship dealing with nitrate of soda.

Dr. Robert Ballenegger of the College of Horticulture, Budapest, Hungary, has been appointed visiting exchange professor and began on March 30 his work with the soils department. H. L. R. Chapman of Romsey, Hants, England, has been appointed head gardener of the botanical garden.

Minnesota Station.—Two new research projects have been begun under the provisions of the Purnell Act. The first, organized by the plant breeding section of the division of agronomy and farm management, contemplates the development of more productive strains of corn. The first phase will be the determination of character of selfed lines which are of importance for breeding purposes, and the second phase the utilization of selfed lines in the production of improved strains and the determination of relative values of single crosses, double crosses, and synthesized varieties. The work will be done at University Farm and the Waseca Substation.

The second project, to be conducted jointly by the dairy and agricultural biochemistry divisions, provides for a detailed study of the causes underlying a serious mineral deficiency problem which is common in Minnesota and affects

dairy production. An attempt will be made to determine by chemical and physiological means the extent and permanency of relief or cures as effected by practical methods of feeding. The relationship of certain mineral elements to growth, reproduction, and lactation and to the storage of calcium and phosphorous during growth will be studied. The results will be checked by chemical analyses and by growth tests of calves on various rations varying in mineral content.

Cornell University and Station.—*Science* announces that a bequest of $25,000 for the use of the College of Agriculture has been received from the estate of the late Gustav Ulbricht, who died February 19, 1924.

The beekeeping library of the department of apiculture has increased from its beginning last January to 2,168 volumes at the present time. Efforts are being made through the U. S. Consular Service to collect the names and addresses of publishers and editors of beekeeping magazines throughout the entire world, and it is announced that the department is prepared to offer exchanges of American for foreign periodicals in this field.

A number of exchanges have been arranged through the International Education Board between the university and foreign institutions. Under one of these Dr. Stepan Soudek, a professor in the Zoological Institute in the College of Agriculture and Forestry at Brno, Czechoslovakia, is making a study of the progress of economic entomology in this country. A part of his time is being devoted to work in economic entomology and apiculture in the College of Agriculture. Dr. Soudek has also devoted two months' time to work in Washington, D. C., and is expecting to make an extended tour of the United States at the close of the college year.

Dr. C. H. Myers, professor of plant breeding, is to replace Dr. H. H. Love of the same department, who returned late in 1925 from a position at Nanking University, China, under a triangular cooperative arrangement between Nanking and Cornell Universities and the International Education Board. Dr. Myers expects to remain at Nanking for nearly a year.

Dr. W. I. Myers, professor of farm finance and in charge of farm management work in the station, has accepted a fellowship from the International Education Board, which runs from February 1 to October 1. He will study agricultural conditions in England, Denmark, Germany, and France as they are related to farm management and farmers' cooperative associations.

Leaves of absence for the spring term have been granted to Dr. J. E. Boyle, G. W. Herrick, H. W. Riley, Dr. L. A. Maynard, and C. R. Crosby. Of these, Dr. Boyle is to investigate the subject of futures trading in Europe, Prof. Herrick will visit several European entomological laboratories, and Prof. Riley will study the practical use of agricultural machinery in this country.

William A. Stocking, jr., professor of dairy industry since 1909, died February 3 at the age of 54 years. Prof. Stocking was a native of Connecticut, graduating from the Connecticut College in 1895 and from Cornell in 1898 and receiving the M. S. A. degree from the latter institution in 1906. After teaching agriculture and nature study for one year in the State Normal School at Mansfield, Pa., and agriculture and dairy bacteriology in the Connecticut College for three years, he began his service at Cornell in 1906 as an assistant professor of dairy bacteriology. Later he was appointed head of the dairy industry department, relinquishing this post in 1923 to devote himself to research. In 1913–14 he was also acting director of the College of Agriculture. He served as president of the American Dairy Science Association in 1916–1918 and as president of the New York State Dairymen's Association in 1922–1924. Besides numerous bulletins and reports, he was the author of Manual of Milk Products (1917).

Luther Shirley West, instructor in parasitology in the department of entomology, has resigned to accept a position in Battle Creek College.

New York State Station.—The seventh of the series of monographs on fruits which is being issued by the station is ready for distribution. This is entitled Small Fruits of New York, and is a 600-page book similar in character and mechanical make-up to preceding volumes of the series. It deals with raspberries, blackberries, dewberries, currants, gooseberries, and strawberries. As with the tree fruits, the book is intended to be a complete record of the development of each fruit, both from the cultural and the botanical viewpoints.

Two pear varieties recently developed on the station grounds are being offered fruit growers in the belief that they are highly resistant to blight and of excellent quality. The new varieties are sister seedlings derived from a cross between Winter Nelis and Russet Bartlett, and they have been named Phelps and Pulteney.

A wild type of tobacco that yields considerably more nicotine than cultivated varieties is believed to merit consideration on the part of fruit growers as a possible source of nicotine for use in sprays and dusts. This variety does well on the station grounds, and tests for the past few years have indicated that it could be grown profitably in New York. The nicotine content is normally much higher than in the cultivated varieties and can be further increased by special methods of cultivation, by topping the plants, and by care in curing the leaves.

Dr. G. J. Hucker, associate bacteriologist, has been awarded one of the two fellowships in bacteriology granted this year by the International Education Board, thus making possible a year's study abroad. Sailing in August, Dr. Hucker will continue his investigations with the Micrococci, particularly the classification and physiology of the group, at Lister Institute, London, in Stockholm, and in Copenhagen. He will also visit important laboratories in Germany, France, Switzerland, and Italy.

North Carolina College.—I. O. Schaub, director of agricultural extension, has also been appointed dean of the School of Agriculture.

Ohio State University and Station.—H. A. Gossard, chief of the department of entomology in the station since 1904 and nonresident professor of economic entomology in the university since 1917, died December 18, 1925, age 58 years. He was a native of Iowa, graduating from the Iowa College in 1889, and receiving the M. S. degree in 1892. Before coming to Ohio, he had served as assistant entomologist in the Iowa Station from 1890 to 1892, as a teacher of science in high schools in Rochester, Minn., and Princeton, Ill., from 1895 to 1898, and as a professor of entomology, zoology, and geology and entomologist of the Florida University and Station from 1899 to 1904. He was a fellow of the American Association for the Advancement of Science and was serving as president of the American Association of Economic Entomologists.

Two new departments have recently been established in the station. One of these is a department of home economics, with Faith R. Lanman, head of home economics work in the university, as chief and Hughina McKay, Elsie Steiger, and Anne Brown as assistants. The other is the department of agricultural engineering, with G. W. McCuen, head of that department in the university, as chief, C. O. Reed as associate, and P. B. Potter, B. M. Stahl, and E. A. Silver as assistants.

J. S. Houser has been appointed chief of the station department of entomology. Other appointments include the following assistants: Joseph Polivka in entomology; J. S. Cutler, F. R. Dreibelbis, and Harold E. Batchelor in agronomy; E. C. Newcomer in rural economics; and J. S. Shoemaker in horticulture.

Washington Station.—Dr. J. W. Kalkus, head of the division of veterinary medicine, has been appointed superintendent of the Western Washington Station at Puyallup to succeed W. A. Linklater, who has resigned to become manager of the Western Washington Fair. For the last three years, Dr. Kalkus has had his headquarters at the Western Washington Station, where he has been studying contagious abortion and red water in cattle.

Miss Inez J. Arnquist, for eight years home demonstration agent in Spokane County, has been appointed research specialist in the station for work under the Purnell Act and will assume her new duties May 1.

Wisconsin University and Station.—A new committee known as the Wisconsin Agricultural Council came into existence in February. Its object is to suggest, if possible, a program for the improvement of Wisconsin agriculture so far as this improvement rests upon economics. The committee is composed of Dr. B. H. Hibbard, as chairman, representing the College of Agriculture; the State commissioners of agriculture and markets; and the presidents of four farm organizations operating in Wisconsin. Three meetings have been held by the committee and another will probably be scheduled for July. For immediate consideration the land question as it pertains to northern Wisconsin is receiving attention.

At this year's farmers' week course a new plan of showing experiment station work was tried. Each department was given an opportunity to feature certain things in the manner deemed most suitable. All of the exhibits were listed in an outline which was available to the visitors, and as a result most exhibits were visited by a large number of people. The smaller departments seem to have profited especially by the arrangement.

At the meeting of the Society of American Bacteriologists held at the university December 29–31, 1925, special recognition was given to the fact that the present year marks the fortieth anniversary of the beginning of formal instruction in bacteriology in the university. Former President E. A. Birge and Dr. William Trelease, who presented the early work in bacteriology in connection with botany courses, spoke briefly concerning their parts in the introduction of this science. Some of the apparatus used in the first courses was also shown.

During the past year 75,168 cows were tested for production in 162 Wisconsin cow testing associations. These animals belonged to 4,212 dairy farms located in 56 of the 71 counties in the State. The testers report that 96.5 per cent of the members in the associations are using purebred sires. A survey of 4,000 farms in the associations has shown that 46 per cent of the members have milk houses, 53 per cent whitewashed barns, 65 per cent barns equipped with individual drinking facilities for cows, 26 per cent milking machines, 28 per cent ventilation systems, 30 per cent running water in the farm home, 99 per cent automobiles, 37 per cent tractors, and 21 per cent trucks.

Unusual interest prevails at present in the area testing for the eradication of tuberculosis in cattle. Among the primary causes for the interest in the situation is the Chicago milk ordinance which prohibits after April 1 the acceptance of any milk for Chicago use except such as comes from tested cattle. The city of Milwaukee is planning to enforce a similar requirement after October 1, which will further affect a number of counties in southeastern Wisconsin.

There are at present 32 Wisconsin counties in which the area test has been completed, and 3 in which the work is nearly finished. Twenty-three additional counties have petitioned the State Department of Agriculture for area testing work, and there are still 13 from which no petitions have so far been filed.

In 1925, 800,013 head of cattle were tested in Wisconsin, and of these approximately 10,000 reacted to the test. About $350,000 was paid in indemnities, of which one-half was met by State funds and the remainder by Federal funds. Since the funds for the current year were exhausted, the governor called a special session of the legislature on April 15, which appropriated an additional sum of $450,000 so that the work may be continued until a new appropriation becomes available on July 1.

Twelve cooperative marketing institutes, which are said to be the first of their kind held in the United States, were conducted in Wisconsin during the past winter. These institutes were located whereever there were groups of persons interested in the marketing of some particular agricultural commodity, so that a commodity marketing organization might be organized. The subjects given most attention were the marketing of foreign-type cheese, American cheese, butter, eggs, and poultry. Experienced men presented various phases of these problems, including marketing of foreign-type cheese, butter marketing, and the cooperative marketing of eggs and poultry.

Demonstration equipment on safety with explosives is being mounted on a large truck by the land clearing section of the department of agricultural engineering, and will visit 60 counties now using explosives. Wisconsin is said to have 50,000 users of agricultural explosives, and while the number of accidents has not been great, those that have occurred are largely preventable, and it is the purpose of this demonstration to reduce them by education.

The potato conferences recently held at the university were attended by several leading representatives of both the potato growing and shipping interests of Wisconsin. Two discussions of particular interest developed; first, the plans of the horticultural department to improve and further develop the State plan of seed potato inspection for 1926, and, second, mosaic control in the Triumph variety by tuber indexing and the immediate application of this work to the growing of foundation seed stock in 1926. Both of these problems formed the basis for subsequent conferences in Madison and in the commercial potato sections.

Ten thousand copies of the 1926 Wisconsin Experiment Association Seed List have been distributed, over $300,000 worth of seed being listed by 300 growers. A feature of the seed list is the large amount of registered and certified seed, both of which have been inspected in the field between heading and harvesting to insure freedom from mixture, weeds, and disease, and have been tested for purity and germination by the State Seed Inspection Department. In the case of corn, the ears have been inspected in the curing rooms to insure trueness to type and proper curing.

According to a recent report by the department of plant pathology, it is estimated that onion growers of Racine and Kenosha Counties reaped a financial gain of about $250,000 last year as a result of the use of the formaldehyde drip for the control of onion smut. It was shown that on the treated rows of plants the disease was thoroughly controlled, whereas on untreated rows the loss was estimated at over 75 per cent.

Office of Experiment Stations.—F. G. Harden, employed by the U. S. Department of Agriculture at various periods in connection with its irrigation investigations and extension work, has been appointed associate agricultural economist and has entered upon his duties. In addition to assisting the Chief of the Office in various administrative matters, he will be actively associated with the abstracting for *Experiment Station Record* in the sections of rural economics and sociology and agricultural and home economics education. These sections have been in charge for several years of Louise Marbut,

who was married on March 6 to Leroy Moomaw, superintendent of the North Dakota Substation at Dickinson.

Union of Czechoslovak Agricultural Experiment Stations.—The various agricultural experiment stations in Czechoslovakia have recently organized as the Union of Agricultural Experiment Stations in Czechoslovakia, with headquarters at Prague. This union will serve as an advisory body for the Ministry of Agriculture, and its functions will consist mainly in the fostering of scientific investigation in the field of agricultural research.

Third North African Conference.—At this conference, which opened at Tunis on March 22, considerable attention was given to agricultural questions. Among the topics discussed were the organization of professional and technical instruction; regulations governing the change of pasture land; repression of fraud in the wool and cereal trades; improvement of sheep raising for wool production; a common policy concerning alfalfa; cooperation between institutions in agronomic research, including a common program for cotton production; protection of the North African cotton regions against the destruction of bolls by the pink worm; and organization of the phosphate industries in North Africa. The Governments participating included Tunis, Algeria, Morocco, and French Occidental Africa.

New Journals.—*Stain Technology* is being published quarterly by the Commission on Standardization of Biological Stains, with Dr. H. J. Conn of the New York State Station as editor. The initial number contains brief accounts of the commission and its work and the following original articles: Standardization of Biological Stains as a Problem of the Medical Department of the Army, by R. W. French; The Oxidation Products of Methylene Blue, by W. C. Holmes and R. W. French; Inhibitory Properties of Anilin Dyes, by J. W. Churchman; Crystal Violet and Erythrosin in Plant Anatomy, by G. Jackson; Staining Protozoa with Janus Green B, by M. J. Hogue; Fuchsin and Picro-Indigo-Carmine, A Polychromatic Stain for Vertebrate Organogeny, by W. Shumway; A Technic for Preparing Frozen Sections, by L. S. Lippincott; and Basic Fuchsin as an Indicator in Endo's Medium, by E. F. Genung.

Zeitschrift für Pilzkunde is being published as the Organ of the German Mycological Association and the Federation for the Promotion of Mycology of Berlin. The initial number consists largely of a monograph entitled The Agaricaceae of Central Europe, by R. Singer.

Quarterly Review of Biology has begun publication under the editorship of Dr. Raymond Pearl. Its purpose is announced as to offer "authoritative and comprehensive reviews of the present state of knowledge in the different fields of general biology." The initial number contains five general articles, among which is A Review of the Discovery of Photoperiodism: The Influence of the Length of Daily Light Periods upon the Growth of Plants, by K. F. Kellerman. Another feature is to be a section of book reviews.

The Indian Veterinary Journal is a quarterly record of surgery and general veterinary intelligence, devoted to the interests of the veterinary profession in the Indian Empire. The initial number contains an account of the proceedings of the Second All-Indian Veterinary Conference, eight original articles, communications, abstracts, etc.

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RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

Sulfur in proteins.—II, The effect of mild alkaline hydrolysis upon hair, W. F. HOFFMAN (*Jour. Biol. Chem., 65 (1925), No. 1, pp. 251–254*).—In this continuation of the series previously noted (E. S. R., 47, p. 310), the action of hot sodium carbonate solutions on the sulfur content of hair was determined by heating 10-gm. samples in 300-cc. Kjeldahl flasks with air condensers on a steam bath for 2, 4, 8, and 16 hours with 1, 2, and 4 per cent solutions of sodium carbonate and determining the sulfur in the hair and in the filtrate and washings.

There was a progressive decrease in the sulfur content of the hair and an increase in that of the filtrate with increasing concentration of sodium carbonate. At a concentration of 4 per cent, 0.73 per cent of the total sulfur in the original sample was accounted for in the filtrate. Nitrogen determinations showed that only a small amount of the hair had been hydrolyzed by the most severe treatment. Since hair which has been heated with 1 per cent sodium carbonate for even a short time can not be used as a source of cystine, it is concluded that a change has been brought about in the cystine molecule by the action of the sodium carbonate.

The individuality of glutenin, M. J. BLISH (*Cereal Chem., 2 (1925), No. 3, pp. 127–131*).—The question of the identity or nonidentity of glutenins from different sources has been studied further in response to a paper by Halton (E. S. R., 53, p. 8).

Using the procedure as described by Halton with the several glutenin preparations available from the work of Blish and Pinckney (E. S. R., 53, p. 409) and with extracts from three flours prepared by the new method of Blish and Sandstedt (E. S. R., 54, p. 309), the author was unable to separate any of the preparations into two fractions. Following a suggestion made by R. A. Gortner that the glutenin used by Halton had become slightly racemized before fractionation and that the racemized protein might have an isoelectric point differing somewhat from that of the natural protein, the procedure was repeated with a slightly racemized protein. Not only was a second fraction obtained having a different isoelectric point from that of the natural glutenin, but another fraction resulted which could be precipitated only by the use of heavy reagents such as phosphotungstic acid. It is concluded that racemization of proteins is accompanied by partial hydrolysis, and that racemized proteins must be regarded as protein derivatives.

The gluten quality of flour and its iso-electric point, E. L. TAGUE (*Cereal Chem., 2 (1925), No. 4, pp. 202–208, fig. 1*).—Using the method previously described (E. S. R., 53, p. 803), the author has determined the point of minimum transference or neutral point, corresponding to the isoelectric point in pure substances, for a patent flour, a clear flour, a low-grade flour, a whole wheat flour, and bran, all from the same sample of Kansas hard wheat. These values in the above order were pH 5.866, 5.664, 5.799, 6.34, and about 6.137.

The tables and curves for the changes in H-ion concentration of the flour suspensions with changes in that of the buffer show that within certain limits on the acid side of the neutral point, the pH values for the flour suspensions remain constant and then rise slowly until the neutral point is reached. Beyond this point on the alkaline side the curves at first rise, then run horizontal for a short distance, and finally rise again. With bran, the pH values remain constant until well beyond the neutral point.

The solubility of gliadin, E. L. Tague (*Cereal Chem., 2 (1925), No. 3, pp. 117–127*).—Data are reported on the solubility of gliadin in hydrochloric, sulfuric and acetic acids of varying concentrations and under varying conditions as to amount and dryness of solute, temperature, and time. Solubility data are also included for gliadin in sodium hydroxide and sodium carbonate solutions and solutions of neutral salts.

At normal and tenth normal concentrations acetic acid dissolved more of the gliadin than either hydrochloric or sulfuric acid. The optimum pH in all cases was about 2, with minimum solubility at about pH 6.5 on one side and 0 on the other. Other points brought out are that dry gliadin is less soluble than moist, that at least 72 hours are required for reaching the saturation point, and that the method of preparation has a considerable influence on the solubility.

Gliadin was very soluble in sodium hydroxide and slightly soluble in sodium carbonate solutions and in aqueous solutions of neutral salts with the exception of magnesium chloride, in which it was quite soluble.

Phytosterols in the endosperm of grain (*New York State Sta. Rpt. 1925, p. 26*).—In this progress report on the study of phytosterols in grains and their by-products (E. S. R., 52, p. 708), it is noted that from the unsaponifiable fraction of the fats obtained from cottonseed meal and linseed meal, mixtures of sterols were obtained from which no definitely homogeneous products could be separated. From rice bran were obtained several sterols, including dihydrositosterol, stigmasterol, and sitosterol, together with some myricyl alcohol and a large amount of a noncrystallizable oil, the nature of which has not yet been determined. Dihydrositosterol and stigmasterol have been identified in corn oil, and it is thought that at least three other sterols are present.

Effect of hydrogen peroxide on relative viscosity measurements of wheat and flour suspensions, R. K. Durham (*Cereal Chem., 2 (1925), No. 5, pp. 297–305*).—Data are presented indicating that hydrogen peroxide produces increased hydration capacity of flour or wheat meal and water suspensions as determined by viscosity with the MacMichael viscosimeter. There appeared to be no correlation between the protein content and increased viscosity with peroxide. Excluding durum wheat, on which but little work was done, there seemed to be a relation between the hardness of wheat and its increase in viscosity with peroxide. Middlings flour showed a greater increase in viscosity than lower grades and flours produced by inferior milling. The peroxide was found to act not upon the gluten but upon the soluble electrolytes of the flour.

Viscosity and baking quality, E. E. Smith (*Cereal Chem., 2 (1925), No. 4, pp. 177–190, figs. 7*).—The viscosities of 10 samples of flour of known grade, origin, and history and covering a wide range in viscosity were determined with a Sheely pipette viscosimeter in the presence and absence of electrolytes, and the curves obtained by plotting the logarithms of the viscosities in seconds against the squares of the flour concentration were compared with the baking qualities of the flour.

The viscosities determined on the flours after the removal of electrolytes did not show any closer correlation with baking quality than those determined

on unwashed flour. All of the flours of high viscosity were of excellent baking quality, but those of low viscosity ranged between excellent and poor baking quality. It is concluded that viscosity can not be used as a measure of baking quality, except possibly in the case of short and standard patents.

A theory of colloid behavior in dough, C. O. SWANSON (*Cereal Chem., 2 (1925), No. 5, pp. 265–275, figs. 2*).—Dough is discussed as a colloidal system composed of masses of starch and protein covered by thin films of water which bind the starch particles together. The protein particles are assumed to form chains or strands which have a rubbery elasticity and are matted together in a mass known as gluten. The quality of a dough is considered to be determined by the number and structure of the particles forming the strands, and by the environment, consisting of water and the water-soluble constituents of the dough. The number of particles is related to the quantity and their structure to the quality of the protein in the flour. These are predetermined by the nature of the flour, but the environment can be controlled and the quality of the dough thus modified to a certain extent.

The residual sugar content of bread, C. B. MORISON (*Cereal Chem., 2 (1925), No. 5, pp. 314–317*).—The term residual sugar is used in this discussion to denote the kind and amount of sugar present in bread baked from a fermented dough, and has been calculated in the preliminary experiments reported by extracting the dried ground bread with ethyl alcohol and determining the reducing sugars by the Official method before and after inversion.

The bread mixed and baked under standard conditions with the introduction of malt extract, Cerelose, sweetened condensed milk, and powdered skim milk in amounts to furnish total sugar to the extent of about 3.9 per cent, equivalent to 2.9 per cent available for fermentation after deducting lactose, was found to contain 5.51 per cent reducing sugars calculated as maltose before inversion and 5.82 per cent after inversion. The residual sugar content of bread made from straight doughs containing 2.5 per cent of cane sugar and Cerelose, respectively, as the only added sugar in the dough was 2.97 before and 3.30 per cent after inversion in the cane sugar bread and 2.77 and 2.88 per cent, respectively, for the Cerelose bread.

Investigation of the pigments of grapes (*New York State Sta. Rpt. 1925, pp. 26, 27*).—In this progress report it is noted briefly that the pigment isolated from the Isabella grape, a hybrid representing *Vitis vinifera* and *V. labrusca*, is identical with the anthocyanin, oenin, found in Seibel seedlings (E. S. R., 52, p. 803). Evidence in proof of its composition is summarized.

The chemistry of adhesive substances, I, II, G. M. DYSON (*Chem. Age [London], 13 (1925), Nos. 335, pp. 488–490, fig. 1; 336, pp. 512–514, figs. 2*).—The author restricts the term adhesives to those colloidal substances of an organic nature which are included in the following groups: (1) Glues and gelatins, (2) casein adhesives (these two groups comprising animal adhesives), (3) vegetable gums, and (4) rubber and gutta-percha cements (vegetable adhesives). The first three of these groups are dealt with in this article, which describes the properties of the various adhesives and outlines methods for their chemical examination. Glues and gelatins classified as hide, bone, animal, and fish glues are treated in considerable detail, with a discussion of various methods for their examination, including external appearance, pH value, viscosity, fusion point, gold number, and mechanical strength.

Biological stains, H. J. CONN (*Geneva, N. Y.: Comn. Standardization Biol. Stains, 1925, pp. 151, figs. 5*).—This handbook on the chemical nature and uses of the dyes employed in the biological laboratory was prepared by the author as chairman of the Commission on Standardization of Biological Stains with

the collaboration of J. A. Ambler, S. I. Kornhauser, F. B. Mallory, and L. W. Sharp.

Following a brief history of staining and a general discussion of the principles of dye chemistry, particularly with reference to their bearing on biological stains, and a description of the spectroscopic method of analyzing dyes, the more important synthetic dyes are described in the four groups in which they belong by virtue of their chromophores—the nitro, azo, and oxy-quinone groups, the quinone imide, the phenyl methane, and the xanthene groups. Brief chapters on compound dyes, the natural dyes, and the theory of staining complete the text proper. Of particular valne to the microscopist are appendixes containing tables on nomenclature and synonyms of stains, the principal uses of the more important stains, and commission specifications of certain stains.

An extensive bibliography is appended.

Phenolphthalol, its preparation and reaction toward oxidases and peroxidases, G. D. Buckner (*Amer. Jour. Physiol., 74 (1925), No. 2, pp. 354–358*).—Directions are given for the preparation of phenolphthalol, $C_{20}H_{16}O_3$, by the reduction of phenolphthalin as prepared from phenolphthalein by the method of Kastle (E. S. R., 21, p. 709) in acetic acid solution with sodium amalgam, and for its use as a reagent for detecting oxidases and peroxidases. It is stated that human blood can be detected with certainty in a dilution of 1 part in 5,000,000 by the peroxidase test with phenolphthalol.

The nature of enzyme action, W. M. Bayliss (*London and New York: Longmans, Green & Co., 1925, 5. ed., [rev.], pp. VIII+200, figs. 9*).—This revision of this well-known monograph (E. S. R., 43, p. 611) brings the subject matter to 1923.

Temperature coefficients of enzymic activity and the heat destruction of pancreatic and malt amylases, D. H. Cook (*Jour. Biol. Chem., 65 (1925), No. 1, pp. 135–146, figs. 2*).—"The rates of starch hydrolysis by pancreatic and malt amylases used in the forms of good grades of commercial pancreatin and malt have been determined under certain specified conditions for the temperature range of 20 to 70° C. At temperatures below the point where destruction of the enzyme plays an important rôle the rate of hydrolysis is about doubled for every 10° rise in temperature.

"The temperature and rate of destruction of these enzymes in water-salt solutions have been determined, and malt amylase is found to be much more stable than pancreatic amylase, the latter being completely destroyed in 15 minutes' heating at 50°, while malt amylase still shows a trace of activity after 30 minutes at 60°; pancreatic amylase is apparently inactivated approximately 80 times as fast at 50° as is malt amylase.

"The results obtained for the rate of destruction of these enzymes show a wide divergence from those giving the rates of destruction of vitamins B [E. S. R., 51, p. 461] and C [E. S. R., 46, p. 865], and make it appear doubtful that any advantage is to be gained by classing vitamins as enzymes as has sometimes been suggested. The results obtained support the view that the heat destruction of the enzyme may be a process of the nature of the coagulation of a protein, probably accompanied by partial hydrolysis also."

Notes on the multiplication of yeast in solutions of purified nutrients, M. B. MacDonald (*Amer. Jour. Hyg., 5 (1925), No. 5, pp. 622–634*).—This contribution to the bios question consists chiefly of suggestions as to the probable cause of the failure to secure continuous multiplication of yeast cells in sugar-mineral salts nutrient solution as reported by various workers. Among the points discussed are the importance of securing an adequate medium and the harm resulting from the presence of certain substances which may exert an

inhibitory action, the importance of acclimatization of the yeast to the medium employed, care in the handling of yeast cells, and the effect of bios concentrates and extracts. Original data are presented, illustrative of the various points discussed.

Standard methods of chemical analysis.—I, The elements. II, Special subjects, edited by W. W. SCOTT (*New York: D. Van Nostrand Co., 1925, 4. ed., [rev. and enl.], vols. 1, pp. XXXVII+749+55, pls. 3, figs. 74; 2, pp. XXVIII+1003–1805+55, pls. 2, figs. 215*).—A revision of the work previously noted (E. S. R., 47, p. 801).

A study of methods for making protein tests on wheat, D. A. COLEMAN, H. C. FELLOWS, and H. B. DIXON (*Cereal Chem., 2 (1925), No. 3, pp. 132–164*).—This investigation by the Grain Division, Bureau of Agricultural Economics, U. S. D. A., was undertaken as a result of wide discrepancies in the data obtained by 43 different laboratories in the determination of the protein content of samples of 1924 hard red spring wheat and hard red winter wheat, prepared and submitted to the laboratories by the senior author and J. H. Shollenberger. The collaborating laboratories included research or experimental, inspection department, mill and elevator, and commercial laboratories.

The summarized data showed a maximum difference in any one sample of 3.15 per cent and a minimum of 0.58 per cent. The ranges of variation were greater with the spring than with the winter wheat, and in the data reported by the commercial and mill laboratories than by the research or inspection laboratories. Data submitted by the various laboratories concerning the technique employed in the determination showed wide variations in every point from the size of the sample to the amount and kind of the receiving acids. With a view to determining which of these factors were of influence in causing such discrepancies in results, the principal variations in technique, in digestion, and in distillation were carried out on uniform samples of wheat. From the data thus obtained the following recommendations are made:

A 1-gm. sample is recommended in place of 2 gm. as requiring less time for digestion and giving results of practically equal accuracy. With a 1-gm. sample and the intensity of heat usually employed by most laboratories, 20 cc. of concentrated sulfuric acid is considered the minimum to digest and retain all of the ammonia. Yellow and red oxides of mercury in 0.5-gm. amounts are recommended as satisfactory catalytic agents, with mercury sulfate slightly less satisfactory. Sodium sulfate and potassium sulfate are of equal value, and should be used in 10-gm. amounts. The formation of a salt cake with sodium sulfate can be avoided by using a mixture of 60 per cent potassium sulfate and 40 per cent sodium sulfate. Copper sulfate is considered to be of little value at low intensities of heat. The original Kjeldahl method is recommended as the only method with which wheat samples can be completely oxidized in less than an hour at all intensities of heat. If the heat is sufficiently intense no difference in results can be attributed to the method. For a 1-gm. sample 45 minutes at high heat and 60 at medium heat are recommended.

In the distillation process attention should be paid to the use of traps, the making of blank determinations, and the use of sufficient acid to hold the equivalent of 35 mg. of nitrogen. At least 100 cc. of distillate should be collected. There is no choice between sulfuric and hydrochloric acids, but there is danger in the use of boric acid of losing ammonia with temperatures above 40°. Sodium thiosulfate can be used in place of sodium or potassium sulfide for precipitating the mecury. The use of potassium acid phthalate is recommended for standardizing the acid solution.

Collaborative study of moisture methods, G. A. Shuey (*Cereal Chem., 2 (1925), No. 5, pp. 318–323*).—A comparative study is reported of the umpire and routine methods of determining moisture in wheat flour as described by Spencer (E. S. R., 53, p. 806), and of the routine method modified by using temperatures of 125 and 135° C. instead of 130°. From 16 to 29 analysts collaborated in the comparisons, which were made on uniform samples of spring wheat flour. The average results obtained for each method were as follows:

Vacuum or umpire method 13.38, routine method at 130° 13.25, routine method at 125° 13.218, and routine method at 135° 13.306. It is concluded that the routine method is dependable within a fairly wide range of temperature.

A temporary cupro-sodium solution (Fehling's reagent) [trans. title], G. Pégurier (*Ann. Chim. Analyt., 2. ser., 7 (1925), No. 10, pp. 289–291*).—The author calls attention to the many modifications of Fehling's solution and proposes still another, which in his opinion has the advantage of being stable and of such composition that 10 cc. is equivalent to exactly 0.05 gm. of glucose. The solution is made up just before use from three standard solutions prepared as follows:

Solution A is prepared by dissolving 150 gm. of tartaric acid in about 300 cc. of hot distilled water, cooling, making up to 450 cc. with distilled water, and filtering. Solution B is prepared by dissolving 52.5 gm. of purified copper sulfate in 200 cc. of water, cooling, and adding 10 drops of pure sulfuric acid and distilled water to a volume of 250 cc. Solution C is the pure sodium hydroxide of the French Pharmacopœia. The solutions are kept separately until required and then mixed in the following order and amounts: 45 cc. of solution A, 25 of solution B, and sufficient of solution C to make 150 cc.

Filtration of raw beet diffusion juice, D. C. Morris (*Internatl. Sugar Jour., 27 (1925), No. 321, pp. 479–482*).—A brief report is given of a study of the practicability of using some form of filtering aid in the clarification of raw beet diffusion juice.

Of three kinds of filtering materials, Filter-Cel, Standard Super-cel, and Hyflo Super-cel, the last named proved by far the most satisfactory. Using a concentration of 0.2 per cent of the filter material and a temperature of 55° C., the filtration rates were 4.2, 26.1, and 39 gal. per square foot per hour in the order named. The filtration rate was found to increase with the temperature. A study of the effect on the rate of filtration of the addition of small amounts of lime showed that by liming to neutrality there was a small reduction in the rate of filtration, but not enough to counteract the advantages of liming with respect to preventing inversion. A repetition of the filtration on a scale corresponding more closely to factory conditions gave equally good results. Analyses of samples of filtered and unfiltered juice indicated a decided reduction in the organic nonsugars, ash, and coagulable matter as the result of filtration with Hyflo Super-cel.

The manufacture of glucose, E. Preuss (*Die Fabrikation des Stärkezuckers. Leipzig: Max Jänecke, 1925, pp. XVI+319, pl. 1, figs. 40*).—This handbook deals chiefly with the processes involved in the manufacture from starch of glucose, corn sirup, and a coloring material similar to caramel.

An apparatus for the rapid preparation of protein milk, W. C. Davison (*Amer. Jour. Diseases Children, 30 (1925), No. 2, pp. 238, 239, fig. 1*).—The apparatus described is adapted from a crank-operated apparatus for forcing thick lubricating grease into automobile gears by removing the hose, mounting the apparatus on a support sufficiently high to place a bucket underneath, and placing in the bottom of the cylinder two disks of 16-gauge brass wire screen (12 wires to the inch) 6 in. in diameter, with two layers of cheesecloth between them. The curd is prepared in the usual way by adding 0.5

oz. of liquid rennet to 1 qt. of whole milk, heating to 100° F., allowing the mixture to stand 15 minutes or more until clotted, and then draining off the whey in a cheesecloth bag.

After cleaning the apparatus by pouring boiling water over the piston and through the cylinder, the drained curd is placed in the cylinder, the piston is put in place, and the crank turned until all of the whey has been forced through and finely divided curd begins to appear. The bucket is replaced by a clean one and the pressure is increased until all of the curd has been forced through. It is said that 1 gal. of curd can be broken up satisfactorily in 10 minutes.

For preparing small amounts of protein milk, the ordinary hand grease gun is recommended.

The manufacture of chocolate, P. Zipperer, rev. by H. Schaeffer and Schröder (*Die Schokoladen-Fabrikation. Berlin: M. Krayn, 1924, 4. ed., rev. and enl., pp. VIII+338, pl. 1, figs. 95*).—A revision of the volume previously noted (E. S. R., 29, p. 312).

The rôle of acidity in vegetable canning, W. V. Cruess, W. Y. Fong, and T. C. Liu (*Hilgardia [California Sta.], 1 (1925), No. 13, pp. 275–293, figs. 2*).—The first part of this investigation consisted of a study of the magnitude of the changes in H-ion concentration taking place in acidified brines during the canning of vegetables by the usual processes. In the first series of experiments known weights of various vegetables were placed in No. 2 cans which were then filled with brine, heated in live steam at from 99 to 110° C. for from 5 to 8 minutes, sealed, and processed for various time periods ranging from ½ to 2 hours. Later 8 oz. cans were used with weighed amounts of vegetables and measured amounts of brine. In both series the H-ion concentration of samples of the brine was determined colorimetrically before and after exhausting and after processing. The brines for all the vegetables except corn consisted of 2 per cent of salt in distilled water, with varying concentrations of hydrochloric, citric, or acetic acid and that for corn the same ingredients plus 5 per cent of sugar.

The pH values of all the acid brines increased (acidity decreased) during exhausting. Brines of relatively low pH values increased and those of high pH value decreased in pH during processing. The changes were more pronounced during exhausting than processing and during the first 20 minutes of processing than later. The increase in pH values was least with acetic acid, followed by citric acid and then by hydrochloric acid. Lemon juice acted similarly to citric acid. Citric acid is considered preferable to acetic acid as not affecting the flavor so noticeably. With the same acid, citric, and the same processing period the changes in pH value of brines did not vary markedly with the different vegetables. The most pronounced changes occurred in peas.

The second part of the investigation was concerned with the effect of the pH value of the brine on the death point of three heat-resistant organisms—*Bacillus sporogenes*, *B. botulinus*, and a resistant strain of a thermophile. In the tests with *B. sporogenes* an original pH of 2.6 or less was found necessary to insure destruction of the spores in 2 hours at 100° in asparagus. This resulted in a final pH of 4.6. Acetic acid proved somewhat more effective than citric. Artichokes canned in citric acid brines of pH 2.6, 3, and 3.6 with a processing time of 1 hour at 100° did not spoil and gave final pH values of 4.6, 4.8, and 5.3, respectively. In string beans the critical initial pH value for the same processing period was from 3.6 to 4.5 and the final value 4.8 to 5. With sweet corn the initial and final values were 3.2 and 5. With

peas processed for 1½ hours the initial pH values were 3 for acetic and 2.6 for citric acid and the final value 5.4 for both. With spinach the initial and final pH values in citric acid brines were from 1.8 to 2.2 and 3.2 to 4, respectively. The high initial acidity required and irregularity in results are attributed to the slow heat penetration in spinach and to the failure of the brine to reach all parts of the tightly packed leaves. After preliminary blanching in acid brines of pH 3, the inoculated spinach was canned without spoilage at initial pH values of from 2 to as high as 6.

In the tests with a thermophile, the spores of which withstood 315 minutes at 100° in glucose bouillon but were killed in 350 minutes, corn was used in brine acidified with hydrochloric and citric acids, the cans being processed at 100° for 1, 3, and 5 hours. The critical pH value after processing was 5.2 with citric acid and 5.4 with hydrochloric acid. At these concentrations processing for 1 hour was as effective as for 5 hours.

For the principal tests with *B. botulinus* spinach and asparagus were used. The asparagus developed typical *B. botulinus* spoilage after 1 hour, but not after 2 or 3 hours' processing with a final pH value of 4. This necessitated an initial pH of 2.8 or less. With spinach a brine of pH 2.2 or less was required unless the material had been blanched in acidified water before canning.

"The results of these investigations can not be applied directly to commercial canning operations until large scale experiments under factory conditions are made. Nevertheless, they show that brines acidified with a small amount of citric or acetic acid greatly reduce the heat resistance of the spores of heat resistant bacteria, and that if the decrease in pH value during heating is taken into account, it is possible to sterilize canned vegetables much more easily in acidified brines than in nonacidified brines."

METEOROLOGY

The new ideas in meteorology, G. C. SIMPSON (*Brit. Assoc. Adv. Sci. Rpt., 93 (1925), pp. 15–29, pls. 3; abs. in Nature* [*London*], *116 (1925), Nos. 2913, Sup., p. 339; 2914, pp. 361–365; Jour. Franklin Inst., 200 (1925), No. 5, pp. 707, 708*).—The new ideas discussed are those relating especially to the thermal stratification of the atmosphere, the mechanism of the atmospheric heat engine, the significance of surfaces of discontinuity in the atmosphere, and the origin of structure of cyclones.

Solar variations and the weather, C. F. B[ROOKS] (*Bul. Amer. Met. Soc., 6, (1925), No. 11, pp. 172–174*).—This is a brief summary, with references, of the more important recent contributions to this subject.

The importance of field-work in the study of climates, R. DEC. WARD (*Amer. Phil. Soc. Proc., 64 (1925), No. 1, pp. 64–77; abs. in Sci. Abs., Sect. A—Phys., 28 (1925), No. 335, p. 789*).—Three stages in the presentation of the climatic description of a district are dealt with: (1) Numerical tabulation of standard climatological data, which is essential for scientific studies, (2) descriptive accounts of weather types and the effect of these on vegetation, crops, and all human activities, and (3) personal experience of weather and climate, which involves field work. The great value of well-chosen photographs and lantern slides in the presentation of the subject is also emphasized.

The climates of the United States, R. DEC. WARD (*Boston and London: Ginn & Co., 1925, pp. XVI+518, pl. 1, figs. 145*).—The author, out of long experience as student and teacher of the subject, has brought together in this textbook the essential facts regarding the climates of the United States in form of a connected story without undue use of technicalities and tabular

and statistical matter. The book, therefore, appeals to the general reader as well as the student. For those who may wish to make further study of the subject numerous well-selected references to literature are provided. The book emphasizes the important work already done, and the author expresses the hope that it will stimulate further research. The chapter headings are as follows: Historical development of climatological work in the United States; the major climatic controls; climatic provinces of the United States; the weather element in United States climates; temperature; frost; prevailing winds and their characteristics; mean annual rainfall; rainfall types and monthly and seasonal rainfall; some characteristics of rainfall; snowfall; humidity, evaporation, and sensible temperatures; sunshine, cloudiness, and fog; thunderstorms; tornadoes; cold waves, northers, and blizzards; hot waves and the Indian summer; hot winds and chinook winds; land and sea breezes and mountain and valley winds; the essential characteristics of United States climates; climate and health; climate and crops; and the climates of Alaska. The chapter on climate and crops is based on an article previously noted (E. S. R., 41, p. 417). The author expresses especial indebtedness to the sections on climate of the *Atlas of American Agriculture* (E. S. R., 40, p. 209; 49, p. 313).

The climate of Alexandria, M. HAMED (*Egypt Min. Pub. Works, Phys. Dept. Paper 19* (*1925*), *pp.* [*3*]+*62*, *pls. 8*).—The available data for atmospheric pressure, temperature, rainfall and evaporation, humidity, cloudiness and sunshine, wind, and state of the sea are summarized in tables and charts and briefly discussed. A bibliography of publications and articles relating to the meteorology of Egypt and the Sudan is appended.

Climate conditions and cotton growing in Southern Rhodesia, C. L. ROBERTSON (*Rhodesia Agr. Jour.*, *22* (*1925*), *No. 7*, *pp. 745–748*, *pl. 1*).—It is shown that in Rhodesia "temperature conditions during the cotton growing season are very different from those prevailing in the American Cotton Belt, in that there is a marked fall in the temperature here during the latter half of the season whilst the reverse is the case in America. For this reason it is probable that the isothermal of 70° F. during the growing period will not necessarily delimit the area of commercial cotton production in this country, and that a higher mean temperature than 70° may be required. . . . For these reasons the isothermal of 72° is adopted as defining the temperature limit of the probable cotton belt in this country."

The temperature is largely determined by altitude; to a less degree by latitude and longitude. In a general way "during November of April the fall in mean temperature per 1,000 ft. rise in altitude is in general about 3°, and varies in the different climatic zones from 3.5° in western Matabeleland to 2.5° in southeastern Mashonaland. The rise in mean temperature as one proceeds from east to west is 0.5° per degree of longitude. The rise in mean temperature as one proceeds from south to north is 0.5° per degree of latitude."

Good yields of cotton have been obtained with 15 in. annual rainfall well distributed during the season. "As the standard deviation of our rainfall is about 7 in., the normal rainfall line of 22 in. annual rainfall will define the area which can be relied upon to have a seasonal rainfall of 15 in. or over in four years out of five. The 22-in. rainfall line has therefore been adopted as defining the rainfall limit of the probable cotton belt in this country."

A map is given which shows areas with (1) mean temperature over 72° and normal rainfall over 22 in. and (2) mean temperature over 72° and normal rainfall under 22 in. It is pointed out that "it is an almost invariable rule in this colony that overnormal rainfall seasons are associated with lower mean

temperatures, whilst undernormal rainfall seasons are associated with higher mean temperatures than the normal."

Rainfall and wheat yields (*Rothamsted Expt. Sta., Harpenden, Rpt. 1923–1924, pp. 47, 48*).—This is an abstract of a paper previously noted (E. S. R., 53, p. 14).

Rainfall at Woburn Experimental Farm, 1923 and 1924 (*Rothamsted Expt. Sta., Harpenden, Rpt. 1923–1924, p. 89*).—A table is given which shows the monthly and annual rainfall and raindays at this place during the years ended September 30, 1923 and 1924. The rainfall of the first year was 23.31 in., of the second 30.25 in.

Review of the abnormal rainfall season of 1924–25, C. L. Robertson (*Rhodesia Agr. Jour., 22 (1925), No. 3, pp. 361–370, pls. 2*).—The season (October to April) 1924-25 was the wettest ever recorded for Southern Rhodesia, the rainfall being 47.61 in., 19.75 in. above the normal and 18.07 in. above that of the four preceding seasons. Such extreme fluctuations are stated to be unparalleled in the history of Rhodesian rainfall, although similar seasons, especially that of 1890-91, are noted. It is suggested that the apparent diminution of rainfall in recent years may be accounted for by an alternation of wet and dry periods, the present being a wet period (beginning in 1917) which presumably may be expected to end about 1930 or 1931, and reproducing conditions prevailing in the season of 1890–91. A study of the relation of barometric pressure to rainfall showed the predominating influence of the northerly or equatorial lows on the rainfall, 60.3 per cent of the rainfall being associated with this type of pressure distribution. The outstanding feature of the last season was the activity and intensity of the northerly lows during the months of January and March, which were responsible for 92 and 76 per cent of the rainfall of those months, respectively. Another active agent in the production of rainfall in Rhodesia is shown to be the approaching southerly high, owing to the converging winds and cooling effect associated with the advancing front.

[**Crop hazards in France in 1922**] (*Jour. Off. Répub. Franç., 57 (1925), No. 135, pp. 5406–5427*).—The results of a Government inquiry into the losses due to adverse weather conditions, insects and diseases, animal pests, and other causes in case of wheat, legumes, potatoes, sugar beets, fruits, and grapes are reported. It is estimated that the losses due to the various causes enumerated amounted to 22 per cent of the total crop. Thirty per cent of the total loss was due to dry winds and drought, 12 to excessive rainfall, 1 to floods, 2 each to spring and autumn freezes, 3 each to winter cold and hail, 2 to storms, and 3 to other meteorological factors, while 15 was due to diseases, 6 to insects, 3 to predatory animals, and 18 per cent to other unidentified causes. Over one-half of the loss is thus attributable to untoward weather conditions.

[**Weather and crop results at Rothamsted, 1922–1924**] (*Rothamsted Expt. Sta., Harpenden, Rpt. 1923–1924, pp. 72–76, 101*).—The outstanding features of weather and crop conditions during the two years ended September 30, 1923 and 1924, are briefly summarized. The season of 1923 was characterized by a sunless spring and early and severe autumn frosts, that of 1924 by excessive precipitation and protracted harvests. The effect of the weather conditions upon the growth and quality of crops is explained in some detail.

Weather guide for gardeners and tree planters at Accra, J. R. P. Gent (*Jour. Gold Coast Agr. and Com. Soc., 4 (1925), No. 2, pp. 134, 135, pl. 1*).—A chart compiled from 20-year records at Akkra, Gold Coast, is given, which "shows for each month of the year the amount of rain which may be fairly relied on, as well as the number of days over which that rain will probably be distributed."

The chart shows a maximum rainfall in June and a secondary maximum in October, the corresponding minima being in January and August. It is stated "that the chart gives expectations that will be slightly exceeded in most years and will be realized in an average poor year."

SOILS—FERTILIZERS

The soils of Florida, O. C. Bryan (*Fla. Univ. Agr. Ext. Bul. 42 (1925), pp. 26, figs. 16*).—This is a preliminary and very general report on the most important soil types of Florida. Florida lies within the Coastal Plain province, and has a rather even topography. The surface drainage is good in the greater part of the western counties and in the central part of the peninsula as far south as Hicoria. A considerable area is poorly drained, especially near the coast. A large portion of the surface soils are sandy and have a low content of the essential plant nutrients. Small areas have a limestone origin and are more fertile, while others have been developed as organic soils in marshes and lakes.

Rock Island County soils, R. S. Smith, O. I. Ellis, E. E. DeTurk, F. C. Bauer, and L. H. Smith (*Illinois Sta. Soil Rpt. 31 (1925), pp. [2]+66, pls. 4, figs. 7*).—This survey deals with the soils of an area of 274,483 acres lying in the Illinoisan glaciation in the northwestern part of Illinois. The topography varies from flat to undulating and rolling. Practically all of the county is drained by the Mississippi and Rock Rivers.

The soils are grouped as upland prairie, upland timber, deep loess, terrace, and swamp and bottomland soils. Forty-two soil types are mapped, of which the yellow silt loam and the yellow-gray silt loam upland timber soils and the brown silt loam upland prairie soil cover 18.08, 10.18, and 15.32 per cent of the area, respectively. Data on the fertility content and crop adaptations of the prevailing soil types are included.

An appendix contains explanations for interpreting the soil survey and information on the principles of soil fertility. A supplement containing experimental field data on five of the prevailing soil types is included.

Glacial limestone soils of Ohio, G. W. Conrey (*Ohio Sta. Bimo. Bul., 11 (1926), No. 1, pp. 24–34, figs. 10*).—A brief survey is presented of the glacial limestone soils of Ohio, the area of which includes all of the western half of the State except the lake plain in the northwest. The surface of the upland varies from almost level to rolling, and areas with a gently rolling to rolling topography exist in various parts of the region. The natural drainage of the level upland areas is poor. The more rolling areas have good surface drainage and from fair to good underdrainage. The area includes seven different soil series, the features of which are briefly discussed.

Prevention of crop injury by windstorms on muck land, P. M. Harmer (*Michigan Sta. Quart. Bul., 8 (1925), No. 2, pp. 83–86*).—A brief discussion is given of the use of water, heavy rolling, and windbreaks in the prevention of crop destruction by wind on muck land.

Soil sampler [trans. title], P. Andrianov (*Nauch. Agron. Zhur. (Jour. Landw. Wiss.), 2 (1925), No. 3, pp. 199–202, figs. 2*).—A borer is described and diagrammatically illustrated, which it is claimed does not disturb the original structure of the soil. The cylinder of the borer is split into two halves, and is fitted with steel cutting edges.

Apparatus for soil volume determination, B. Frosterus and H. Frauenfelder (*Internatl. Rev. Sci. and Pract. Agr. [Rome], n. ser., 3 (1925), No. 1, pp. 100–104, pl. 1*).—This apparatus is described and its use demonstrated.

Some moisture relationships of soils, M. M. McCool and A. W. Weidemann (*Soil Sci., 20 (1925), No. 3, pp. 243-247*).—Studies conducted at the Michigan Experiment Station are briefly reported which point strongly to the theory that soils are capable of holding appreciable amounts of water in such a condition that it does not function as a solvent and is made unfree. This water seems to be both physically adsorbed and chemically combined.

[Moisture-holding power of soil], V. A. Tamhane (*Bombay Dept. Agr. Ann. Rpt. 1922-23, pp. 172-174*).—Studies are reported which showed that the maximum moisture-holding capacity of soil was increased about 8 per cent within 12 days after the addition of green manure. It then gradually fell to its original level about 60 days after the addition of green manure. The retentive capacity of soils for water was also greatly increased within about a month after the addition of green manure. While this gradually decreased, even after 96 days it did not fall as low as it was before the addition of green manure. The power of the soil to hold water against a particular centrifugal force was increased about 1.4 per cent 12 days after the addition of green manure, but this small increase mostly disappeared within a few days. This is taken to indicate that the water-delivering power of the soil to the roots of plants was not materially changed.

Moisture fixation in soil [trans. title], G. Wiegner, R. Gallay, and H. Gessner (*Kolloid Ztschr., 35 (1924), No. 5, pp. 313-322, figs. 5*).—A review of studies by the authors and others of moisture fixation in soils as a colloidal chemical phenomenon is presented.

It has been found that moisture conduction, which is primarily a mechanical problem in coarse sandy soils, becomes a colloidal phenomenon as the degree of dispersity of the soil increases. The purely capillary action of the void spaces in soils of medium dispersity are of primary importance in moisture fixation, while in soils rich in clay particles the electrolytes present are the most important.

Experiments by Gallay showed that the properties of clay are primarily dependent upon the degree of hydration of the electrolytes present. A clay exhibits marked lyophile properties the more thoroughly hydrated the cations are which surround the clay particles and which are in electrical equilibrium therewith. The less hydrated these cations are the greater are the lyophobe tendencies. It was found in this connection that a sodium clay as a lyophile clay of high viscosity exhibits a high resistance to coagulating materials, while a hydrogen or potassium clay as a lyophobe clay of low viscosity possesses a low resistance to coagulation.

Coagulation was found to be generally accompanied by base exchange, this consisting primarily of strongly hydrated ions as stabilizers exchanging with the less hydrated coagulators. Hydration of the ions decreased as the atomic volume increased.

Adsorption by activated sugar charcoal, with particular reference to adsorption and soil acidity, E. J. Miller (*Michigan Sta. Tech. Bul. 73 (1925), pp. 7-60*).—Data obtained in a study of the nature of adsorption by activated sugar charcoal are brought together, and their possible bearing on adsorption and acidity in soils is pointed out. Many points of similarity were established between the adsorption phenomena displayed by pure activated sugar charcoal and the behavior of acid soils.

The evidence indicated that the behavior of charcoal toward acids and bases is common to many other substances. It is considered reasonable to expect that whenever a substance exhibits a preferential adsorption for either acids or bases, hydrolytic adsorption of salts by that substance is a possibility. "Furthermore, if the surface forces or partial valences involved in a

reaction as simple as the formation of crystalline barium sulfate from potassium sulfate and barium chloride can cause the solution to become acid or alkaline, depending upon which of the salts is in excess, it is no longer unreasonable to expect marked changes in the reaction of the soil solution through the operation of the surface forces on the colloidal and crystalloidal materials which make up the soil."

Hydrogen-peroxide catalase of marsh soils, L. SMOLÍK (*Internatl. Rev. Sci. and Pract. Agr.* [*Rome*], *n. ser., 3* (*1925*), *No. 1, pp. 105–120, figs. 2*).—In a contribution from the Marsh Soil Experiment Station at Brno, Czechoslovakia, investigations are reported to determine the hydrogen peroxide catalase in types of marsh soil, and to find out how it changes after partial sterilization at a temperature of from 50 to 100° C. (122 to 212° F.), after boiling, and after heating to a red heat, and how various temperatures and hydrogen peroxide concentrations during the reaction show their influence with reference to physical composition, hygroscopicity, carbonate content, and reaction.

The results showed that, in the subsoils treated, the hydrogen peroxide catalase increased with the depth, as did likewise the hygroscopicity and the constant and variable H-ion concentration. The soils having the greatest catalytic force showed a higher constant pH, and at the same time a higher calcium carbonate content. On the other hand, soils with the lowest catalase showed a lower constant pH.

After drying the soils at 50°, the catalytic power altered irregularly, increasing in some soils and decreasing in others. After drying at 100° or after boiling in water for 1 minute the catalytic power of the majority of the soils decreased, and after heating to a dull red heat it decreased in all cases, but irregularly. With an increased hydrogen peroxide concentration and with a higher temperature during the reaction, the quantity of oxygen liberated also increased.

Carbon dioxide production and gas permeability of soil [trans. title], H. LUNDEGÅRDH (*Arkiv Bot., 18* (*1923*), *No. 13, pp. 36, figs. 7*).—Methods are described for the determination of the carbon dioxide emission from free soil surfaces and of the absolute carbon dioxide production of soil at different depths, and studies of soil respiration and the factors influencing it are reported.

It was found that the free soil respiration, the absolute carbon dioxide production of the soil mass, and the carbon dioxide content of the soil air stand in simple mathematical relation to each other and to the gas permeability of the soil. The quotient $\frac{\text{soil respiration}}{\text{soil air concentration}}$ was found to express the permeability of homogeneous soils. It was necessary also to consider the absolute carbon dioxide production for heterogeneous soils. This involved the parallel determinations of carbon dioxide formation and of carbon dioxide content at different depths in order to determine the permeability of the different soil layers.

Permeability was found to be directly proportional to the diffusion coefficient and can be expressed in terms of the latter. Parallel determinations of the absolute carbon dioxide formation of the soil mass and of the fee soil respiration indicated the amounts of carbon dioxide fixed in the soil or transported by soil water. The gas permeability of soil was increased by cultivation and dryness and was decreased by decreasing porosity and by dampness.

The absolute carbon dioxide production, or so-called activity of the soil mass, was quite variable, but nearly always decreased with depth. It was accelerated by moisture so long as the permeability was not decreased, by the deep inter-

mixing of stable manure, by the introduction of dilute solutions of different nutrient salts, and by improved ventilation of the soil.

H-ion concentration and humus content apparently stood in no near relation to the soil activity, and the latter could be increased over 800 per cent by artificial fertilization. The free soil respiration of unfertilized cultivated soils had an average value of around 0.4 gm. per square meter per hour. Fertilization resulted in marked increases in respiration, especially in forest soils. The amounts of carbon dioxide respired by soil were found to be of the same order as those absorbed during assimilation by crops, and it was possible by fertilization to produce an atmosphere surrounding crop leaves enriched in carbon dioxide.

Soil air factors [trans. title], A. G. Doĭarenko (*Nauch. Agron. Zhur.* (*Jour. Landw. Wiss.*), *2* (*1925*), *No. 3, pp. 163–175, figs. 7*).—Studies of the oxygen requirements of the roots of crops are reported, which led to the conclusion that the oxygen content of normal soil air is inadequate to meet the requirements of crop roots without an exchange with the atmosphere. It was further concluded that the most important factor in the aeration of soil is the daily temperature variation which brings about a so-called respiration process in the soil. The intensity of this process under average conditions of temperature variation was found to be 12 per cent, which it is estimated would result in a complete change in the soil air every 8 days.

The intensity of soil respiration was found to also depend largely on the soil structure and condition, and the noncapillary porosity appeared to be the active soil element in this respect. Decreasing the noncapillary porosity of the soil decreased its permeability to air, especially in the case of moist soil. This is taken to indicate the importance of regulating the ratio of air to moisture in soils.

The ammonia content of soil and its relation to total nitrogen, nitrates, and soil reaction, H. J. Harper (*Jour. Agr. Research* [*U. S.*], *31* (*1925*), *No. 6, pp. 549–553*).—Studies conducted at the Iowa Experiment Station are reported.

No correlation could be made when the ammonia content of a large number of soils was compared with the total nitrogen content, the accumulation of nitrates, or the soil reaction. It is considered evident that the ammonia content of a soil is in equilibrium with the products of protein hydrolysis and nitrification, just as the nitrate content is in equilibrium with the ammonia content of the soil and the plants and microorganisms.

The ammonia content of most field soils did not exceed 20 parts per million, and the majority of soils contained less than 10 parts per million. It was found that the ammonia content of some soils may occasionally be as high as 60 or 70 parts per million. This is considered to be due to conditions unfavorable for nitrification or to vigorous ammonification, or to both of these factors operating simultaneously.

Relation of nitrification processes to the solubility of the phosphoric acid of podsol soil [trans. title], F. S. Sobolev (*Nauch. Agron. Zhur.* (*Jour. Landw. Wiss.*), *2* (*1925*), *No. 3, pp. 186–198, fig. 1*).—Studies on the influence of late and early fallowing of soil and of cropping to rye after each on the solubility of soil phosphoric acid are reported.

A significant parallelism was found between nitrification and mobilization of soil phosphoric acid, especially on late fallowed soils, and on both early and late fallowed soils subsequently cropped to rye. The contents of water-soluble phosphoric acid, nitrate, calcium, and bicarbonates were greater and the H-ion concentration higher on early fallowed soil than on late fallowed soil during the entire summer. On the soils where cropping to rye followed fallow the reverse was true.

The nitrate and phosphoric acid curves of early fallowed soils, the calcium curve of both early and late fallowed soils, and the bicarbonate and H-ion concentration curves of all soils showed three maxima during the summer which occurred practically at the same time for the different factors, all occurring during periods of warm and dry weather. The reaction of the soil extract showed an approximately quantitative relation with the bicarbonate content.

It was further found that fallowing of podsol soils had a different effect on the solubility of the phosphoric acid content than similar treatment of black soils. In the latter soils an increase in nitrate content was accompanied by a decrease in the water-soluble phosphoric acid.

Plate counts of soil microorganisms, N. R. SMITH and S. WORDEN (*Jour. Agr. Research* [*U. S.*], *31* (*1925*), *No. 6, pp. 501–517, figs. 3*).—Studies conducted by the U. S. D. A. Bureau of Plant Industry are reported which showed that the suspension of the bacteria in a soil sample may be effected by means of an electric vibrator of high frequency. Plate counts made from such a suspension and from one made by hand shaking gave concordant results. Higher numbers obtained by the vibrator method were taken to indicate either incomplete sterilization of the vibrator or incomplete dispersion by hand shaking. The great difficulty of manipulating the vibrator precluded its use as a routine procedure.

Plates poured with soil-extract agar gave higher and more uniform results than those poured with other media. Plate counts on soil-extract agars made from type soils, ranging from loamy sand to muck, showed that field soils of fair fertility are suitable for making soil-extract agars to be used in estimating the total number of soil microorganisms, irrespective of their general character and location. Plate counts of soil samples taken horizontally from a level approximately 4 in. below the surface were slightly higher and more uniform than those of samples taken vertically with an auger.

It was found that fluctuations of 20 per cent above or below the average total count may occur with a uniform soil if one series of dilutions is made and soil-extract agar is used as the plating medium. A more selective medium gave much wider fluctuations. Duplicate series of dilutions of a composite soil sample showed similar fluctuations. This is taken to indicate, therefore, that a total count, to be of any value, should represent the average of three or more separate counts.

Pot-culture experiments, 1923, J. A. VOELCKER (*Rothamsted Expt. Sta., Harpenden, Rpt. 1923–1924, pp. 89–97*).—The progress results of these studies are presented in detail and discussed (E. S. R., 50, p. 819).

Studies on the influence of lead compounds on wheat for both 1922 and 1923 gave practically the same results, and indicated that lead as chloride is toxic and will almost entirely destroy a crop at a concentration of 0.5 per cent. After the removal of the soil from the pots at the close of the experiment, it was noted that with the higher concentrations a deposit of metallic lead had formed around the edge of the soil on the inside of the pots.

Experiments on the effect of uranium compounds on wheat indicated that, with the doubtful exception of a 0.1 per cent dose of sodium diuranate, uranium had no good effect and in most forms was actually harmful.

An extension of green manuring experiments begun in 1895 on one soil and in 1911 on another indicated that mustard and tares as green manures apparently gave better results when lime or a complete manure including lime was added. Further studies on the relative values of lime and chalk and of magnesia and magnesium carbonate on wheat showed that there is a very marked difference between the effect of caustic lime and that of calcium carbonate, and also between lime and magnesia. Caustic lime was found to

be a far more active form than chalk, and while its addition up to from 2 to 3 tons per acre produced much benefit on soil requiring lime, magnesia in the caustic state prevented the growth of the crop when used in those amounts. It was also found that ground limestone, whether magnesian or not, exercised no influence for a time.

A comparison of ammonium sulfate and ammonium chloride on wheat indicated the superiority of the chloride.

Fertilizer suggestions for Barry County soils, M. M. McCool and J. O. Veatch (*Michigan Sta. Circ. 71 (1925), pp. 8, fig. 1*).—Practical suggestions on the use of fertilizers on the soils of Barry County, Mich., are presented.

The manuring of poor pastures in the Bristol Province, T. Wallace (*Univ. Bristol, Agr. and Hort. Research Sta. Ann. Rpt. 1923, pp. 26–37*).—Data are reported which indicate that phosphatic fertilizers, generally basic slag, are efficient in improving the herbage of many of the poor pastures met with in the Bristol Province. Basic slag used alone has been found to improve pastures on soils containing calcium carbonate and on acid soils. This fertilizer has also proved effective on several soils containing apparently only small supplies of available potash. The application of lime alone to pastures on acid soils did not appear to improve the herbage materially.

Fertilizing value of ammonium sulfo-nitrate [trans. title], J. Graftiau and P. Hardy (*Bul. Soc. Chim. Belg., 33 (1924), No. 8–9, pp. 465–467*).—Studies are reported which showed that ammonium sulfo-nitrate is a very active nitrogenous fertilizer and is markedly superior to sodium nitrate in rapidity of action. However, this apparent difference in value is equalized by the sodium nitrate owing to its greater residual action.

It is concluded, therefore, that the two nitrogenous fertilizers are of practically equal fertilizing value, but that the ammonium sulfo-nitrate is superior where particularly rapid action is desired or for crops such as sugar beets which are sensitive to sodium. It has the disadvantage, however, of setting free acids in the soil when nitrified.

Granulated calcium cyanamide [trans. title], P. Dutoit (*Chim. et Indus. [Paris], 11 (1924), No. 2, pp. 223–228*).—Studies are reported on a method of granulation of calcium cyanamide which transforms the powdered material into stable, noncaustic granules having a very low content of dicyandiamide. An appropriate technique, involving the addition of water to crude calcium cyanamide and submitting it to high pressure of short duration, was found to result in a granulated material from which the nitrogen losses were small and which contained a negligible amount of dicyandiamide.

Action of urea as a nitrogenous fertilizer, its influence on soil reaction [trans. title], C. Brioux (*Ann. Sci. Agron. Franç. et Étrang., 42 (1925), No. 2, pp. 115–123, pl. 1*).—Studies are reported which showed that in both the laboratory and the field urea is a fertilizer equal to sodium nitrate, and sometimes slightly superior. Its action is analogous to that of ammonium salts, since it is transformed rapidly to ammonium carbonate in the soil. Its action was found to be slower and more prolonged than that of sodium nitrate. Urea was found to act as an alkali in soil at first, due to its rapid transformation to ammonium carbonate, but as it was nitrified its action became that of an acid-reacting substance.

Period of toxicity of different nitrogenous fertilizers to the germination of wheat [trans. title], L. Maume and J. Dulac (*Ann. Sci. Agron. Franç. et Étrang., 42 (1925), No. 2, pp. 81–107, figs. 11*).—Experiments on an inert soil, a normal cultivated soil, and a humus soil to determine the influence of nine organic and inorganic nitrogenous fertilizers on wheat at the time it emerges from the soil are reported.

It was found that these fertilizers could be separated into two groups. The first group consists of those which are immediately beneficial to crops, and the second comprises those which are beneficial after certain chemical reactions have taken place. Each of the fertilizers in the second group was found to have its place in a particular agricultural practice, and it was impossible to say that one fertilizer was better than another.

The carbonate and bicarbonate of ammonium were the least toxic of any of the fertilizers, and their optimum effects were obtained with light applications. These effects were of only short duration, however. Urea was very active in calcareous soil, and was soluble and nontoxic even in heavy applications. Horn meal closely approached urea in efficiency when finely ground. Ammonium chloride was slightly inferior to ammonium sulfate, due to the difficulty of eliminating the calcium chloride formed. Galalith was found to be a slowly acting fertilizer, and is considered to be suitable for tropical soils.

The final efficiency rating of these fertilizers in their order as regards toxicity, 13 days after application at the rate of 90 kg. of nitrogen per hectare (80.1 lbs. per acre), was ammonium carbonate, ammonium bicarbonate, ammonium sulfate, urea, sodium nitrate, horn meal, ammonium chloride, galalith, and ammonium nitrate.

Residual action of phosphatic fertilizers [trans. title], J. GRAFTIAU and [P.] HARDY (*Bul. Soc. Chim. Belg., 33 (1924), No. 8–9, pp. 462–465*).—Studies are reported which showed that the soluble phosphoric acid from different phosphatic fertilizers not utilized by crops during the first year of culture was largely utilized during the second year, and that relatively little reverted to insoluble forms.

Decomposition of raw phosphate with peat [trans. title], S. ROZANOV (*Nauch. Agron. Zhur.* (*Jour Landw. Wiss.*), *2 (1925), No. 2, pp. 110–120*).—Experiments on the solubility of the phosphoric acid of raw phosphate in mixtures with peat of 1 part of raw phosphate to 8 and 16 parts of peat are reported. Solubility determinations were made at periods varying from one day to six months after the composting began.

The solubility of the phosphoric acid of the compost was less in citrate solution than in water, especially at the beginning of the composting, and only after six months of composting were similar results obtained with the two solvents. The water-soluble phosphoric acid decreased with time from 9 to 7.3 per cent for the 1:8 compost and from 15.1 to 14.5 per cent for the 1:16 compost. When water-soluble phosphoric acid in the form of calcium phosphate was mixed with peat a part of it was adsorbed by the peat, and it could not be completely dissolved out again by different solvents.

Fertilizing action of disintegrated phosphates containing potassium and sodium [trans. title], J. GRAFTIAU, J. GIELE, and P. HARDY (*Bul. Soc. Chim. Belg., 33 (1924), No. 8–9, pp. 451–462*).—Tests of disintegrated phosphates containing potassium and sodium in comparison with other phosphates either in the presence or absence of alkaline materials are reported.

The results indicated the considerable fertilizing value of disintegrated phosphates and that such phosphates of low citrate solubility gave as good results as phosphates of high citrate solubility.

The potassium of disintegrated phosphates was found to be active as a fertilizer, but contradictory results were obtained as regards the sodium. Both the sodium and potassium acted favorably as neutralizing agents in the presence of nonbasic fertilizers. The favorable influence of the basicity of disintegrated phosphates was found to be of the same order as that of phosphatic slag but somewhat less marked.

Influence of soil reaction on the absorption of phosphorus and potassium in the presence of different phosphatic fertilizers [trans. title], A. NĚMEC and M. GRAČANIN (*Compt. Rend. Acad. Sci. [Paris], 181 (1925), No. 4, pp. 194–196*).—Studies on the assimilation of phosphorus and potassium by plants from soils of varying reaction and receiving different phosphatic fertilizers are reported.

Rye was found to assimilate much more phosphorus from acid phosphate in acid soils than in neutral soils. The same was true with the more insoluble phosphates, such as Constantine phosphate and Italian tetraphosphate.

The absorption of potassium by crops was greater in acid soils than in slightly alkaline soils, and the greatest absorption occurred in soils treated with acid phosphate.

Vegetation experiments with lime fertilization [trans. title], B. GOLUBEV (*Nauch. Agron. Zhur. (Jour. Landw. Wiss.), 2 (1925), No. 3, pp. 207–220, figs. 4*).—Experiments are reported which showed that liming of podsol soils resulted in the energetic mineralization of the nitrogen compounds of these soils into forms available to crops. On the other hand, the nitrogen compounds of black soils were very incompletely decomposed as a result of liming, and the resulting crop development was scanty. Heavy liming favored blue lupines on unsaturated podsol soil, and the treatment of black soils with ammonium sulfate and calcium carbonate favored the mustard crop. The injurious effect of excessive liming of podsol soil was found to be related to the concentration of calcium in the soil extract.

Mineral resources of the United States, 1924, part 1, compiled by M. B. CLARK (*U. S. Geol. Survey, Min. Resources U. S., Summary Rpt., 1924, pt. 1, pp. II+108A*).—This is the seventh annual preliminary summary of the mineral production of the country, and contains an introductory statement by F. J. Katz.

Commercial fertilizers, J. L. HILLS, C. H. JONES, and G. F. ANDERSON (*Vermont Sta. Bul. 248 (1925), pp. 3–40*).—Guaranties and actual analyses of 326 samples of fertilizers and fertilizer materials, representing 148 brands, collected for inspection in Vermont during 1925, are reported, together with a discussion of fertilizer grades, commercial fertilizers as a substitute for labor and in relation to season, soil, and seed, and farm management and fertility maintenance.

AGRICULTURAL BOTANY

Localization of the response in plants to relative length of day and night, W. W. GARNER and H. A. ALLARD (*Jour. Agr. Research [U. S.], 31 (1925), No. 6, pp. 555–566, pls. 4*).—In a previous publication (E. S. R., 49, p. 326) the authors showed that coordinate branches of *Cosmos bipinnatus*, subjected to different exposures to light, responded in a very dissimilar manner. In the present paper an account is given of experiments with *C. sulphureus*, a typical short-day plant, in which different portions of the primary stem were exposed to different illuminations.

When the upper portion of the plant was exposed to the full length of day of summer, while the lower portion received only 10 hours of light daily, the latter promptly flowered, while the former remained vegetative. When the central portion of the axis was exposed to a long day, while both the lower and uppermost portions were subjected to the action of a short day, flowering was initiated in both the latter portions of the axis, while the central portion continued to develop only vegetative shoots. On the other hand, when the central portion of the axis was exposed to a short day and the upper and lower portions to a long day, flower buds appeared in the former, while

both of the latter remained vegetative. When the upper portion of the stem was excluded from light continuously for a period of from three to five weeks, while the lower portion received the light of a short day and subsequently was forced into flowering, the formation of buds was induced in the upper, darkened portion, and open blossoms appeared after the top had been restored to the full length of day. However, when the lower portion of the axis received the light of a long summer day, and therefore was prevented from flowering, while the upper portion was maintained in continuous darkness, the latter formed no flower buds and resumed vegetative activity when returned to the light. When an entire plant was excluded from the light for a period of 10 days and then returned to the action of the long day, flower buds did not appear.

These experiments are believed to indicate that, under the conditions, continuous darkness in itself does not definitely initiate flowering, but, on the other hand, it does not necessarily inhibit formation of flower buds in response to the action of a short daily light period on another part of the plant.

Effect of length of day on flowering and growth, M. A. H. Tincker (*Nature [London], 114 (1924), No. 2862, pp. 350, 351, figs. 2*).—An attempt has been made under the conditions prevailing at the Welsh Plant Breeding Station to test for results similar to those reported by Garner, Bacon, and Allard (E. S. R., 51, p. 125) regarding the photoperiodism of plants, and to test particularly the behavior of various strains of herbage plants under different lengths of day.

Everblooming plants (*Poa annua*) flowered normally under all light periods. Of two short-day plants used, *Chrysanthemum* sp. flowered precociously for shortened illumination. *Phaseolus vulgaris* flowered 4 days early for 6-hour illumination, but made small growth.

Of long-day plants, lists are given, including grasses, about 11 strains; clover, 3 strains; oats, 4 strains; radish, 1 strain; and foxglove.

Some observations and suggestions regarding "nyctinasty," W. T. Saxton (*Jour. Indian Bot., 3 (1923), No. 5, pp. 127–142, figs. 14*).—Observation and discussion are presented of some plants common in India as to night and day positions and movements from one position to the other. It is argued that the night position is normal to plants, the so-called nyctinastic movement being merely the return of the plant to its normal position after the stimulus of light, here regarded as one of physiological strain, is withdrawn. Plants not showing such movements either have a normal position suited to daylight requirements or else lack sufficient elasticity to return to the normal position after departing from it.

Attempts at reversal of geotropic response, A. A. Haike (*Mich. Acad. Sci., Arts, and Letters, Papers, 3 (1923), pp. 111–122, pls. 2*).—Experiments attempting to produce reversal of geotropic response as undertaken included the employment of acetic acid vapor, vaseline coating, olive-oil coating, and carbon dioxide atmosphere for stems, and ammonia vapor for roots, young seedlings being placed horizontally in the dark. The results are detailed, with explanations involving criticisms.

The action of Röntgen rays on plants, I. Esdorn (*Untersuchungen über Einwirkung von Röntgenstrahlen auf Pflanzen. Inaug. Diss., Christian-Albrechts-Univ., Kiel, 1924, pp. 30, figs. 7*).—This is a university thesis.

Optimum temperatures for growth of some grass coleoptiles, F. C. Newcombe (*Mich. Acad. Sci., Arts, and Letters, Papers, 3 (1923), pp. 203–210*).—In consequence of apparent contradiction between the report of Nybergh (E. S. R., 28, p. 630) and those of De Vries (E. S. R., 30, p. 725; 34, p. 628), the present author studied the growth rate of the coleoptile at different temperatures in

various species indicated. The results are tabulated, with discussion as to thei proper treatment and interpretation.

The behaviour of chloroplasts and other cell-contents at low temperature, F. J. Lewis (*Abs. in Brit. Assoc. Adv. Sci. Rpt., 92 (1924), p. 449*).—"The changes in shape and position of the chloroplasts in the leaf cells of species of Picea, Pinus, Abies, and Thuja at the Pacific coast are described. Comparison is made with the features present in conifers native to Alberta in the winter observations being made on plants outside and others kept at greenhouse temperature.

"The ability of the chlorophyll to carry on carbon assimilation while in the winter condition at laboratory temperatures is discussed on experimental evidence."

Adhesion of protoplasm to cell wall and the agents which cause it, G. W. Scarth (*Roy. Soc. Canada, Proc. and Trans., 3. ser., 17 (1923), Sect. V pp. 137–143*).—In certain types of abnormal plasmolysis, in which the protoplasm maintains partial or complete contact with the cell wall, adhesion alone is thought to be causal, and not necessarily increased permeability or stiffening. On the alkaline side, only, of a point between pH 4 and pH 5, cations favor this adhesion in degrees corresponding to those of their general activity in the precipitating negative colloids. The only anions active in the ordinary pH range are those of chromates and dichromates. Washing in water reverses this effect which is also antagonized completely by methylene blue even in very weak solution. Hypotheses as to the causation of adhesion are discussed.

Variations in volume of and movements of liquids in trees, D. [T.] MacDougal (*Abs. in Brit. Assoc. Adv. Sci. Rpt., 92 (1924), p. 444*).—"Dendrographic measurements of several species of trees show that the trunks undergo variations in volume, which may be correlated directly with the transpiratory activity of green surfaces, which in turn varies with the width of the stomatal slits.

"The period in which stomatal slits are widest is one of contraction of the trunk; closure of stomata is accompanied or followed by expansion of the trunks. Contraction of the trunks or stems of mesophytes and sclerophylls takes place in the daytime; contraction of flattened or cylindrical stems of cacti takes place at night and expansion in the daytime, in reverse of the occurrences in the more general type.

"The time or hour at which these two phases of variation prevail changes with the season. At the time of maximum growth contraction in coniferous trees may begin within a half hour after sunrise.

"Such reversible variations are modifiable by changes in relative humidity, by defoliation, girdling, topping, or any agency which alters transpiration or rate of conduction; and are explainable on the basis of Professor Dixon's conception of the mechanism of the ascent of sap.

"The upward path of moving solutions of a basic dye such as fuchsin is found to be in the wood formed within the previous two years; when two layers are formed in a season, conduction is chiefly in the one formed earlier. Whether the other layers are more available or suitable for the downward conduction of organic material is yet to be tested.

"The amount of reversible variation in the diameter of a young pine may be 1 part in 170, in the upper part of a tree approaching maturity 1 part in 900; in the basal region 1 part in 1,700; in a large root 1 part in 364. As this variation takes place chiefly in the outer wood, it is found that in such recently formed layers the coefficient of expansion and contraction may be 5 to 10 times greater than that of the trunk taken as a whole."

The ascent of sap and transport of food materials in trees, H. H. Dixon (*Abs. in Brit. Assoc. Adv. Sci. Rpt., 92, (1924), p. 443*).—This is an outline of discussion by the author of recent observations, by several workers named, as confirmatory of the cohesion theory of the ascent of sap; measurements of the tensile strength of water; demonstration of continuous water columns in intact wilting plants; direct observations on the effects of tension in transpiring shoots; functions assigned to living cells in raising the sap; action of leaf cells; temporary transpiration in dead leaves; water secretion by cells; energy supply; cohesion theory and transport; carbohydrates, proteins, and enzymes in the transpiration stream; ringing; changes in wood parenchyma and tracheae; action of callus; upward conveyance by wood of organic substances; downward transport; unsuitability of bast; necessary velocity; reversed current in wood; transference of stimuli; connections of growing and producing parts with storage organs; introduction of organic substances into tracheae; local permeability differences; determination by tension of mass movement of contents of tracheae from any source to any sink; function of bast and parenchyma; and association of bast and wood.

The translocation of the food materials of the wheat seedling, L. E. Yocum (*Jour. Agr. Research* [*U. S.*], *31* (*1925*), *No. 8, pp. 727–744, figs. 4*).—The author describes some of the chemical and physical changes which take place during the germination of wheat. It is claimed that during the early stages of germination of the wheat seedling the ether extract disappears from the seed more slowly than the carbohydrates or nitrogen and accumulates in the plumules and roots more slowly than any other food material investigated. The small amount of sugars normally found in the wheat kernel is said to increase rapidly in the seed during the first 6 days of germination, when nearly three-fourths of the starch has been used. After 6 days the amount of sugar decreases, and after 12 days the plants are dependent upon their photosynthetic powers for carbohydrates. Under the conditions of this experiment, the embryo appeared to depend on the endosperm for about 6 days for its carbohydrate supply.

The hemicelluloses appeared to be of little importance in the development of the plant, and the plumules and radicles showed no marked difference in the percentage of acid hydrolyzable materials during the germination period.

Nitrogen was found to be translocated rapidly in the 3-day seedling, but after that the percentage remained constant in the axes. The nitrogen content of the seed is said to decrease in proportion to the weight during the first 9 days, and after that a more rapid loss occurs.

Wheat seedlings are believed to require proportionally larger quantities of minerals than any other food material. The maximum ash content of plumules and radicles is said to be reached in from 12 to 15 days. The roots are said to take in minerals more rapidly than they are translocated in the early stages of germination.

The concentration of the cell sap was found to decrease from 2 to 12 days, after which an increase took place. This follows closely the changes in water, sugar, and ash contents of the plant.

The regional and seasonal distribution of potassium in plant-tissues, E. S. Dowding (*Abs. in Brit. Assoc. Adv. Sci. Rpt., 92* (*1924*), *p. 446*).—This paper deals with the occurrence of potassium in plant tissues as shown by the hexanitrite of cobalt and sodium. In plants of contrasting physiological types, a characteristic potassium distribution was noticed for almost every tissue, some appearing to act as storers of excess potassium. All meristematic tissues give a very dense reaction.

In recording the seasonal variation of potassium in *Picea canadensis*, it was found that toward spring there was an increase in the amount in the conducting tissue, a redistribution of potassium within the bud, and a variation in the manner of distribution within the mesophyll cells.

Sulphate content of the leaf-tissue fluids of Egyptian and upland cotton, J. A. Harris and C. T. and W. F. Hoffman (*Jour. Agr. Research* [*U. S.*], *31* (*1925*), *No. 7, pp. 653–661*).—In continuation of investigations which showed the differentiation of upland and Egyptian types of cotton by the physicochemical properties of their leaf tissue fluids (E. S. R., 52, p. 327), the authors give the results of studies on the sulfate content of leaf tissue fluids of Meade and Lone Star upland cotton compared with Pima Egyptian cotton grown under irrigation in Arizona. The sulfate content of the upland varieties was found to be higher than that of the Egyptian variety, the differences ranging from 18 to 28 per cent of the upland value. These results, as compared with those of the earlier study of chloride content, are said to show that as far as the varieties investigated are concerned the behavior of the two types of cotton, with respect to the absorption of chlorides and sulfates, is quite different, the Egyptian type taking up larger quantities of chlorides and the upland types absorbing larger quantities of sulfates.

Age of seedlings as a factor in the resistance of maize to sodium chloride, G. J. Harrison and C. J. King (*Jour. Agr. Research* [*U. S.*], *31* (*1925*), *No. 7, pp. 633–640, fig. 1*).—On account of the suggested possibility of breeding plants resistant to alkali (E. S. R., 19, p. 526), the authors undertook to determine the effect of the age of seedlings as influencing their resistance to salt solutions. Water cultures with sodium chloride (18,000 to 22,000 parts per million) were employed, the grain being sprouted and then transferred to the salt solution.

The stage of development of the seedlings was found to be an important factor in determining the amount of salt in solution which they were able to withstand. In testing the youngest stages of seedling development, using various lengths of radicles as a basis of grouping, the resistance increased up to certain limits in proportion to the length of the radicles. The greatest number were killed by strong salt solutions when the radicles were about 25 mm. long, and the smallest number when they were about 100 mm. in length.

The extent of the development of the plumule was found to be the most satisfactory indicator for preparing uniform groups of seedlings in the older stages. The stage at which the older seedlings were most resistant was just prior to the unfolding of the first true leaf. The young seedlings with short radicles and undeveloped plumules were found to be most susceptible, the oldest plants with two seed leaves were next in susceptibility, and the intermediate stages were the most resistant. Seedlings whose radicles were destroyed earliest by the salt solution made the most rapid plumule growth, due to the rapid development and early functioning of the permanent roots. Artificial excision of the radicles increased the resistance of the seedlings to a marked degree, causing a prompt and comparatively rapid development of the permanent roots and plumule, even while exposed to a strong salt solution.

The authors state that it was found impossible to obtain consistent results when comparing the behavior of seedlings subjected to salt solutions on different dates, the resistance apparently being influenced by changes in weather conditions.

Removal of endosperm from Zea mays [seeds] [trans. title], F. Bressenich (*Jahrb. Wiss. Bot.*, *63* (*1924*), *No. 2, pp. 231–272, figs. 7*).—Calcium sulfate hinders the removal of the endosperm from seed grains of *Z. mays*. The H ions of various acids exert a similar influence in general, though each may

have a specific effect, which appears to be exerted by the anion or by the undissociated molecule. Hydrochloric acid is much more retardative than is phosphoric acid at a given pH value. Particularly favorable conditions for endosperm removal are noted in the neighborhood of pH 5. The hydroxyl ion exerts a limiting action, which decreases toward the point of neutrality.

The dependence of endosperm removal in Zea mays upon different salts [trans. title], P. DAHM (*Jahrb. Wiss. Bot.*, *63* (*1924*), *No. 2*, *pp. 273–320*, *figs. 2*).—In studies proceeding along lines relating to those followed by Bessenich (see above), and employing methods claimed to secure about 80 per cent freedom from infection by microorganisms, the author found considerable differences in sugar content between grains from the same ear and greater differences between grains from different ears. Adequate comparisons can be made only when the grains studied are from the same ear and are worked with at the same temperature and during the same periods. The effects of different chemical substances are recorded.

The endosperm of maize contains, in the dry state, no diastase. For starch hydrolysis the aleurone layer appears to be requisite, this tissue, and not the scutellum, being, apparently, that in which diastase is formed.

The formation of starch in maize endosperm is not a purely enzymatic process. It requires as a condition also the life activity of the cell. During endosperm removal, diastase diffuses into the liquid.

On the leaf-tip tendrils of certain monocotyledons, A. ARBER (*Jour. Indian Bot. Soc.*, *3* (*1923*), *No. 6*, *pp. 159–169*, *pls. 3*).—A comparative examination of plants having elongated leaf tips able to function as tendrils shows all the leaf tendrils to conform to one comparatively simple type, though the morphological explanation is not correspondingly simple. The study of leaf-tip tendrils in monocotyledons leads to the view that the general anatomical scheme on which these organs are constructed is determined by the inherent anatomical tendencies of the species, rather than by the response to a common physiological need.

Vegetative reproduction by root runners in two species of Clerodendron, R. H. DASTUR (*Jour. Indian Bot.*, *3* (*1923*), *No. 5*, *pp. 143–147*, *figs. 2*).—Bud formation on roots, regarded frequently, if not usually, as a phenomenon of senescence, is here discussed as occurring on young and healthy plants. The buds arise from runners produced by the roots of *C. infortunatum* and *C. fragrans*, which propagate themselves more or less profusely by this means. Further study of these plants is contemplated.

A flora of the economic plants of California, W. L. JEPSON (*Berkeley: Assoc. Students Store*, *1924*, *pp. 223*, *figs. 17*).—It is the purpose of the author to describe in a systematic way, for the use of beginners, not all but the more important of the economic plants of California in connection with the more important or better known varieties.

Flora of Utah and Nevada, I. TIDESTROM (*U. S. Natl. Mus., Contrib. U. S. Natl. Herbarium*, *25* (*1925*), *pp. 665*, *pls. 16*, *figs. 2*).—The present volume is devoted to a flora of Utah and Nevada and that part of Arizona lying northwest of the Colorado River. It was prepared with the assistance of others having special knowledge of certain groups, H. L. Shantz on the plant ecology of the desert areas and A. W. Sampson on the ecology of the mountain flora. The systematic treatment is based on collections in the U. S. National Herbarium and the U. S. D. A. Forest Service, to which collections the author was a contributor.

Many remote districts, particularly of Nevada, are said to be still imperfectly known. The region affords a highly varied topography, and its flora ranges consequently from arctic to subtropical and from truly desert elements

to the humid elements of the Rocky Mountains and the Sierra Nevada. Within this region are found most of the plant formations which characterize the western United States, and here also flora typical of the western United States meets flora which is typical of northern Mexico, the general north and south trend of the mountain ranges favoring a dovetailing of floras.

The age and rate of growth of British Columbia trees in relation to ecological factors, A. H. HUTCHINSON (*Abs. in Brit. Assoc. Adv. Sci. Rpt., 92 (1924), p. 453*).—Showing was made in regard to rate of growth as indicated by annual rings during the stages of youth, maturity, and old age under varying ecological conditions. The factors determining rate of growth frequently differ from those determining the age of maturity and decline.

How to know the mushrooms and toadstools, F. C. STEWART (*New York State Sta. Circ. 82 (1925), pp. 11*).—Suggestions are offered relating to the study of mushrooms, and popular descriptions are given for a number of the more common edible fungi.

General systematic bacteriology, R. E. BUCHANAN (*Baltimore: Williams & Wilkins Co., 1925, pp. 597*).—The present volume, the first of a series of monographs in the general field of systematic bacteriology, presents data which have been collected, compiled, and annotated largely in connection with courses of lectures in systematic bacteriology given to graduate students in bacteriology at the Iowa State College during the previous 15 years. "The first chapter of the present volume is devoted to a brief history of the various classifications of bacteria that have been proposed up to the present time. . . . The second chapter has to do with codes of nomenclature and their relationships to the problems of bacterial terminology. . . . The third chapter is an alphabetical list of all the names which have been used by various authors to designate bacterial subgenera, genera, or higher groups so far as a rather comprehensive study of the literature has revealed them."

Systematic studies of bacteria (*New York State Sta. Rpt. 1925, p. 23*).—In continuation of studies on the Coccaceae previously noted (E. S. R., 52, p. 519), investigations were made of the red chromogenic bacteria, and they were found to cause a rotting of whitefish eggs at fish hatcheries, a decomposition of sardines at canning factories, and a red spotting of plantation rubber in the Tropics, besides occasional reddening of common cooked foods such as bread, rice, cauliflower, etc.

The imperfect stage of some higher Pyrenomycetes obtained in culture, L. E. WEHMEYER (*Mich. Acad. Sci., Arts, and Letters, Papers, 3 (1923), pp. 245–266, pls. 3*).—During the fall of 1921 and that of 1922 higher Pyrenomycetes were cultured from single spores or single asci. As a result life history connections were obtained which are here noted, and their temporary position suggested.

The quantitative estimation of bacteriophage, M. S. MARSHALL (*Mich. Acad. Sci., Arts, and Letters, Papers, 3 (1923), pp. 327–332, figs. 2*).—Evidence is claimed to show that the bacteriophage is a colloidal particle, two methods of enumeration being given. The present work is concerned chiefly with the discrepancies of enumeration and with the quantitative aspects of phenomena involving lytic principle action.

The staling of fungal cultures, C. A. PRATT (*Abs. in Brit. Assoc. Adv. Sci. Rpt., 92 (1924), p. 445*).—Staleness in Richards's solution is not due to food exhaustion in case of *Fusarium* sp. The medium becomes alkaline, its pH value changing approximately from 4.6 to 8.6, due mainly to the accumulation of potassium bicarbonate, which at pH 8.2 inhibits growth. Acidifying only partially restores the germinative capacity of the stale medium. Acidification liberates simple organic acids, metabolic products of the fungus, and these

acids are growth inhibitors. The salts of organic acids are not toxic, that is, not active in the alkaline medium. The staleness of the medium, i. e., its loss of germinative capacity, is, therefore, ascribed to the accumulation of potassium bicarbonate due to carbon dioxide from respiration.

[**Effect of straw on plants**] (*New York State Sta. Rpt. 1925, pp. 20, 24*).—In a study of the detrimental effect of straw on the growth of seedlings, the presence of toxic compounds was found, but it was demonstrated at the station, through controlled experiments, that microorganisms are not responsible for the immediate detrimental effect.

Fixation of gaseous nitrogen by higher plants other than Leguminosae [trans. title], G. Truffaut and N. Bezssonoff (*Sci. Sol [Truffaut], 4 (1925), No. 1, pp. 56, pls. 2, figs. 16*).—In the presence of nitrogen-fixing bacteria (*Clostridium pasteurianum*) maize developed normally to maturity in a medium lacking nitrogen.

Physiological aspects of soil solution investigations, D. R. Hoagland (*Hilgardia [California Sta.], 1 (1925), No. 11, pp. 227–257*).—A critical analysis is given of some of the problems that have arisen in the author's investigations on the physiological action of soil solutions toward various types of plants.

GENETICS

Studies in mammalian spermatogenesis.—V, The chromosomes of the horse, T. S. Painter (*Jour. Expt. Zool., 39 (1924), No. 2, pp. 229–247, figs. 27*).—In continuing the series of studies dealing with chromosome behavior during spermatogenesis in mammals (E. S. R., 51, p. 334), the author has made observations on the testicles of two 3-year-old thoroughbred race horses, and discussed the results in relation of those of S. Kirillow[1] and J. E. Wodsedalek.[2] The large numbers of chromosomes found made the counting and pairing very difficult, but sections of the spermatogonia and first maturation divisions indicated that the diploid number in the horse is approximately 60 chromosomes.

In the studies of the spermatogonia the larger chromosomes were found to have mates of similar size and shape and in certain cases showing definite peculiarities. After matching up 58 of the chromosomes, 2 of unlike shape and size remained which were thought to be the X and Y chromosomes. The studies of the first maturation division corroborated the findings in the spermatogonia. The cells were so small that a detailed study of the chromosomes could not be made in the second maturation division.

The chromosomes of Zea mays, E. L. Fisk (*Natl. Acad. Sci. Proc., 11 (1925), No. 6, pp. 352–356, figs. 7.*)—During a cytological study in about 25 pedigreed strains of corn including wide differences in type, in progress at the University of Wisconsin, a haploid number of 10 chromosomes and a diploid number of 20 have generally been found. Cells of root tips in division in most forms studied gave a definite number of 20. While there is a distinct variation in the length of the somatic chromosomes, they could not be separated into distinct long and short classes. In one adventitious root tip of Black Mexican sweet corn from material selfed for one year, a variation from 20 to 23 chromosomes was found, the number in most instances being 22. Preliminary cytological studies on the endosperm of a number of varieties of corn revealed no cases of irregularities in division figures.

The appearance of chromosomes as observed in counts in diakinesis, on the heterotypic and homeotypic equatorial plates, in the anaphases, and in interkinesis is described.

[1] Arch. Mikros. Anat., 79 (1912), No. 3, II, pp. 125–147.
[2] Biol. Bul. Mar. Biol. Lab., Woods Hole, 27 (1914), No. 6, pp. 295–324.

Two types of rumplessness in domestic fowls: A morphological comparison, W. LANDAUER and L. C. DUNN (*Jour. Heredity, 16 (1925), No. 5, pp. 152–160, figs. 13*).—The authors report a study of the anatomy of the rumpless fowls previously noted (E. S. R., 54, p. 322). It has been found that rumpless fowls lack the oil gland, the last two vertebrae of the synsacrum, the free caudal vertebrae, and the pygostyl. The muscles of the pelvis have somewhat different attachments than in the normal fowl, and some of the muscles are probably missing. Both hereditary and accidental rumpless individuals were morphologically similar. A discussion of the origin of hereditary rumplessness indicates that the vertebrae which are missing in the rumpless fowl never start to develop.

An experiment in selecting corn for yield by the method of the ear-row breeding plot, L. H. SMITH and A. M. BRUNSON (*Illinois Sta. Bul. 271 (1925), pp. 565–583, figs. 2*).—The alteration of protein and oil content of the grain and the height of the ear on the cornstalk through ear-row breeding (E. S. R., 52, p. 433) led to a 10-years' test of the efficiency of the ear-row system as a means of improving the yield of corn.

Continuous selection for high yield and low yield in an adapted unnamed variety resulted in marked separation of the two strains with respect to yield. Since the high-yield strain did not significantly surpass a control strain propagated from the original stock by careful field selection without pedigreed breeding, it appeared that the yield difference between the high and low strains was caused mainly through a decrease in the low-yield strain. Continuous selection by means of the ear-row breeding plat can not be recommended as a method of increasing the yield of a well adapted corn variety, whereas its yield can be maintained and perhaps somewhat increased by continuous mass selection (E. S. R., 52, p. 227).

The productiveness of successive generations of self-fertilized lines of corn and of crosses between them, F. D. RICHEY and L. S. MAYER (*U. S. Dept. Agr. Bul. 1354 (1925), pp. 19, pls. 8, fig. 1*).—In investigations in cooperation with the Tennessee Experiment Station, supplementing previous work (E. S. R., 50, p. 830), the yields of 70 F_1 crosses between lines of corn self-fertilized for six generations before crossing ranged from considerably less to more than the yield of the parent variety. The fact that the average yield of three of the crosses was 30 per cent more than that of the parent variety is held to indicate that these crosses are significantly more productive than the F_1 varietal cross Whatley×St. Charles White, outstanding in varietal comparisons in northeastern Arkansas.

Comparisons between successive generations of self-fertilized lines and between crosses following self-fertilization for several generations showed the importance of selection in obtaining larger yields by the methods followed, and indicated that the principal rôle of self-fertilization is to isolate definite distinct lines among which selection may be practiced. While it is necessary to have inbred lines productive in themselves, the data show that little or no relation exists between the productiveness of the self-fertilized lines and that of their crosses. The final value of the lines for crossing must be determined by comparisons of the productiveness of their crosses.

The influence of season, temperature, age, and other factors on sex ratio and segregation [trans. title], W. CHRISTIE (*Ztschr. Tierzüchtung u. Züchtungsbiol., 3 (1925), No. 3, pp. 367–378; also in Nord. Jordbrugsforsk., 1925, No. 2, pp. 65–77*).—The author has discussed the results of various experiments in which modified sex ratios appear to have occurred, including the paper previously noted (E. S. R., 51, p. 334). Differences in the sex ratios were observed during different parts of the season, and alterations in the

expected 1:1 ratios occurred when pigeons heterozygous for the color dilution factor (sex linked) were backcrossed with recessives. The reason for the divergence in the sex ratio does not seem clear, but possible hypotheses are suggested.

Sex reversal in hemp [trans. title], K. Hirata (*Jour. Soc. Agr. and Forestry, Sapporo, 16 (1924), No. 69, pp. 145–168, pl. 1, fig. 1*).—Investigations with Karafuto and Tochigi hemp at Hokkaido University showed that the sex ratio in hemp is not decisively affected by the color, maturity, or weight of the seed or the soil fertility, although female plants outnumbered males in varying proportions on all plats. The haploid chromosome number is 10. In Tochigi hemp, the members of one of the chromosome pairs differed from each other.

Removal of parts of the branches and stems in the early stage of blooming was followed by sex reversal in about 50 per cent of both male and female plants of Karafuto, whereas the rate of sex reversal so caused was extremely low in Tochigi. The author suggests that some individuals are pure for the sexual state and can not reverse their sexual expression. Others are impure and may reverse their sex in response to external or internal stimuli, although remaining sexually pure under normal conditions.

Invariable occurrence of male sterility with dietaries lacking fat soluble vitamine E, H. M. Evans (*Natl. Acad. Sci. Proc., 11 (1925), No. 7, pp. 373–377*).—In continuing the study of the vitamin previously found to prevent sterility in the female rat (E. S. R., 51, p. 167), it has been found that male rats reared on rations lacking in this substance, now designated as vitamin E, were fertile when first attaining sexual maturity, but usually became sterile at from 90 to 150 days of age. Of 180 males reared on diets lacking in vitamin E, all became sterile. Fifteen second and third generation males from mothers reared on diets lacking in E except for the administration of minute amounts of a highly concentrated extract sufficient to induce fertility were sterile from the beginning of sexual maturity.

Four stages in the development of male sterility were described. In the first stage normal numbers of sperms were present in the vaginal plug, but they were without fertilizing power. Abnormal or fused spermatozoa were also found toward the end of this stage. In the second stage no sperms were found in the vaginal plug, which was formed in less than half of the matings. No vaginal plug was formed in the third stage, which was also accompanied irregularly by a loss of sexual response. The fourth stage showed a complete loss of sex response. Changes in the seminiferous epithelium resulting in a complete loss of the epithelium accompanied the development of the sterility.

The administration of from 1 to 6 drops daily of an ether extract of wheat germ was found to permit fertility indefinitely or for an extended period, depending on the amount of extract given. If sterility had been established it was overcome with difficulty, but after long periods of feeding with a wheat germ extract fertility resulted in about 20 per cent of the cases, which is thought to be due to the presence of small amounts of normal seminiferous tubules. Supplying the small amounts of wheat germ extracts tended to improve the sex response and increase the growth.

A histological study of sterility in the albino rat due to a dietary deficiency, K. E. Mason (*Natl. Acad. Sci. Proc., 11 (1925), No. 7, pp. 377–382*).—Preliminary experiments at Yale University and the Connecticut State Experiment Station have indicated that rats could be grown normally on artificial diets, but that they were usually sterile. The females seemed to ovulate normally, but the embryos, though apparently normally implanted, were aborted or resorbed in the late stages of gestation.

In further experiments, 130 male rats were raised on a diet of 18 per cent casein, 54 per cent starch, 15 per cent lard, 9 per cent butterfat, and 4 per cent salt mixture, plus 0.4 gm. daily of yeast tablets. One testicle was removed from 95 of the males at different periods and the other testicle at a later date for histological comparison. Five stages of testicular degeneration were observed. In the first stage, the sperms tend to clump together, forming irregular masses which are eventually passed off through the epididymis. In stage two the sperms have disappeared from most of the tubules, and the spermatids show a beaded appearance as the result of the rupture of the nucleus and deposition of chromatin on the nuclear wall. The cell walls of the spermatids tend to disappear, and the cytoplasm of the germinal epithelium segregates preparatory to the formation of the giant cells of the next stage. In the third stage, giant cells resulting from the segregation of from 2 to 40 degenerating spermatid nuclei are evident. The cytoplasm of the epithelium becomes fibrous and vacuolated due to the sloughing off or dissolution of the degenerate germ cells and giant cells, resulting in a watery condition of the testes. A few giant cells in different stages of dissolution and spermatocytes and spermatogonia in different stages of necrosis are present in the fourth stage. In the fifth stage the germinal epithelium is reduced to a syncytium of Sertoli cells in a fibrous stringy layer of cytoplasm. Though a marked shrinkage in the size of the tubules occurs, the Sertoli and the interstitial cells show no degeneration.

The degenerative changes in the testicles were found to begin in from 50 to 60 days in young rats and to be completed in about 100 days. Older rats, however, when placed on a deficient diet after sexual maturity required from 75 to 100 days for producing the degeneration. Rats in which degeneration of the seminiferous tubules had started partially recovered when given 40 gm. of lettuce daily, provided some normal or nearly normal tubules were still present.

The effects on fertility and the sex-ratio of sub-sterility exposures to X-rays, A. S. Parkes (*Roy. Soc. [London] Proc., Ser. B, 98 (1925), No. B 691, pp. 415–436, pl. 1*).—In continuing the studies of factors affecting sex ratios at the University College, London (E. S. R., 54, p. 262), the effect on the sex ratio and fertility of exposing the scrotum of male mice to doses of X-rays too small to cause sterility was investigated.

Three exposures of 10 minutes each to 3,000 milliampere seconds caused sterility with the equipment used. For the substerility dose one exposure of 10 minutes was employed. The males were immediately mated after the treatment with one or more untreated females. The date of conception was calculated as 20 days prior to the date of parturition. The sex ratio as given in the percentage of males in the population was 49.7±1.52 per cent among the 493 offspring produced in the first experiment by irradiated males as compared with 51.6±1.24 per cent among the 735 offspring produced by untreated males. The young from conceptions occurring within 4 days after irradiation were 60.3±4.01 per cent males, from conceptions 5 to 18 days after irradiation 31.3±4.50 per cent males, and from conceptions occurring over 19 days after irradiation 54.6±3.37 per cent males. A second experiment was conducted under similar conditions with like results, the percentage of males being for conceptions 0 to 4, 5 to 18, and over 19 days after irradiation 58.5, 34.7, and 54.2 per cent, respectively.

A compilation of the results of the two experiments indicated that the occurrence of males had been increased 7.8±3.12 per cent in the litters from conceptions occurring during the first 4 days after irradiation and reduced 18±2.93 per cent in conceptions occurring from 5 to 18 days after irradiation.

A study of the effect on fertility of this treatment indicated that the litter size had been reduced from 6.34 for normals to 6.1 for the treated animals. The size of litters of treated animals also increased from 5.54 for conceptions within 4 days of irradiation to 6.39 for conceptions occurring more than 19 days after irradiation. The difficulty of explaining an effect of the treatment of the male on fertility is pointed out. The operation of the X-rays in modifying the sex ratios is discussed, and it is concluded that since the litter size is not greatly affected and since the males are in excess at first and the females later that the variation must be due to the sex ratio at conception. Several hypotheses were offered to explain the results, but none seemed satisfactory.

Histological studies of testicles of treated animals showed the presence of large numbers of spermatocytes and abnormally large numbers of spermatids in the tubules. A few tubules showed necrosis. Spermatozoa removed from the epididymis of males soon after irradiation were normal and as active as those from normal males.

FIELD CROPS

Farm crops, I–IV, edited by W. G. R. PATERSON (*London: Gresham Pub. Co., 1925, vols. 1, pp. IX+356, pls. 10, figs. 36; 2, pp. VII+306, pls. 9, figs. 51; 3, pp. VII+307, pls. 2, figs. 15; 4, pp. VII+316, pls. 3, figs. 57*).—The aim of this comprehensive treatise on farm crops has been to present full information regarding the principles underlying maximum crop production, especially for conditions in the British Isles. The four volumes which comprise articles contributed by specialists in the various lines of work are as follows:

I. *Grain crops.*—This includes The Domestication of Plants, Wheat, and Oats, all by W. G. Smith; The Improvement of Cultivated Plants, by T. Anderson; The Wheat Crop, by A. W. Oldershaw; Continuous Wheat Growing, by [E.] J. Russell; The Oat Crop, by W. G. R. Paterson; Products of Wheat, and Products of Barley, both by T. B. Wood; Products of Oats, by R. A. Berry; Barley, by H. Hunter; The Rye Crop, and The Mashlum Crop, both by D. G. O'Brien; Dredge Corn, by W. Borlase; The Bean Crop, and The Pea Crop, both by J. Porter; Products of Beans, and Products of the Pea, both by C. Crowther; The Cost of Production of Grain Crops, by J. Wyllie; Parasitic Fungi of Cereals, by H. Wormald; and Insect Enemies of Grain Crops and Grasses, by R. S. MacDougall.

II. *Root crops.*—This includes The Early Potato Crop, by J. M. Hannah; The Potato Crop, by R. G. White; Composition and Products of the Potato, and Composition and Nutritive Value of Swedes and Turnips, both by R. A. Berry; The Turnip Crop, by W. Riddet; The Mangold Crop, by W. Strang; Composition and Nutritive Value of Mangolds, and Composition and Nutritive Value of Sugar Beet, Kohl-rabi, Cabbage, Kale, Rape, Carrots, and Parsnips, both by T. B. Wood; The Sugar Beet Crop, by R. N. Dowling; The Cabbage Crop, by J. C. Brown; Kohl-rabi, Rape, Kale, and Marrowstem Kale, all by W. J. Malden and A. F. R. Nisbet; Carrots, by E. A. Porter and A. F. R. Nisbet; Parsnips, by E. A. Porter; Cost of Production of Potatoes, Turnips, etc., by J. Wyllie; Diseases of Root and Potato Crops, by D. G. O'Brien; and Insect Enemies of Root and Potato Crops, by L. A. L. King.

III. *Pastures and hay.*—This includes Pasture Plants, by T. J. Jenkin; The Temporary Ley, Permanent Grass, and Seed Production and Seed Testing, all by R. G. Stapledon; Grassland in Scotland, by W. M. Findlay; The Hay Crop, by W. Strang; Chemical Composition of Pasture Plants and Hay, by T. B. Wood; Sainfoin, by W. J. Malden and A. F. R. Nisbet; Lucerne and Crimson Clover, both by H. M. M'Creath; Vetches or Tares, by A. W. Oldershaw; Insect

Enemies of Pasture Plants, by R. S. MacDougall; Diseases of Grasses, Lucerne, and Sainfoin, by D. G. O'Brien; and Diseases of Clover, by E. S. Salmon and D. G. O'Brien.

IV. *Miscellaneous crops.*—This includes Rotations, by V. C. Fishwick; Ensilage, and Lupins, both by A. W. Oldershaw; Hops, by A. H. Burgess; Diseases of Hops, by E. S. Salmon; Osiers and Willows, by H. P. Hutchinson; The Tobacco Crop, by J. Hanly; Hemp, by J. V. Eyre; Chicory, Heather, and Miscellaneous Crops, all by W. G. Smith; Buckwheat, by J. G. Stewart; Mustard, by F. A. Smith and W. J. Malden; Linseed or Flax, by F. K. Jackson; Weeds of Arable and Grass Land, by A. N. M'Alpine; and Fruits and Vegetables, by D. V. Howells.

Report of the [Danish] State Plant Culture Committee for the fiscal year 1924–25 [trans. title] (*Beret. Statens Planteavlsudv. [Denmark], 1924–25, pp. 155*).—This report outlines the organization of the Danish experiment stations, reviews briefly the work of each station in 1924, and presents an account of the revenues and expenditures of the stations for the fiscal year 1924–25, together with a summary of the budget for the fiscal year 1925–26. A list is given of the station publications beginning with 1895, including 184 titles, as well as a list of 78 titles of station articles published in agricultural and other journals since 1904.

Agronomic experiments in 1924 [trans. title], A. Sjöström (*Red. Ultuna Landtbr. Inst. [Sweden], 1924, pp. 20–33*).—A report is presented on rotation experiments conducted on different soil types with different crops and on time and rate of seeding tests.

Good yields of winter wheat were secured after bare fallow, but after grass the yields were about 25 per cent less. The yields of rye after pasture were about 20 per cent lower than the yields after fallow. Barley and oats preceded by root crops or beans produced larger yields than where they followed winter wheat or rye, the barley showing much the greater differences in yield. Grass the first year made the best growth after spring-sown grain and the second year after fall-sown grain. In a comparison of alfalfa and red clover the average yield of alfalfa for the second and third years surpassed the corresponding yield of red clover by 35 per cent. Rye following alfalfa gave somewhat better yields than rye following red clover.

The use of 280 kg. of seed per hectare (249.2 lbs. per acre) gave a larger yield of winter wheat than was obtained from 230 or 180 kg. Rye sown at the rate of 230 kg. per hectare gave better returns than that sown at either 180 or 130 kg.

The results of experiments conducted for a series of years on green forage production with barley, oats, peas, and vetch indicated that from about the middle of July to about the middle of August there was an average weekly increase in these crops of approximately 600 kg. per hectare of dry matter and 11 kg. per hectare of nitrogen.

Work of the [Swedish] Seed Association Experiment Station at Ultuna in 1923 and 1924 [trans. title], R. Torssell (*Red. Ultuna Landtbr. Inst. [Sweden], 1924, pp. 34–69*).—The results of variety tests with different field crops in 1923 and 1924 are reported, together with the reviews of earlier results.

The leading varieties in yield as determined by the results for a series of years were Pansar and Sol II winter wheat; Stjärn rye; Klock II, Klock III, Engelbrekt, Stormogul, and Roslag oats; Prinsess, Brage, and Chevalier II barley; Torsdags and Gyllen peas; Extra Kolben and Kolben spring wheat; Eckendorfer Red and Barres mangels; Bangholm and Gul Svensk swedes; Östersundom and Bortfelder turnips; Svalöf Improved red clover; and Grimm II, Ultuna, and Frankisk alfalfa.

[Field crops experiments at the State Research Farm, Werribee, Victoria] (*Victoria Dept. Agr., Werribee Research Farm Guide Book, 1924, pp. 8–46, figs. 19*).—Experiments reported on in summary form embraced rotations, green manure and grazing trials, variety tests and breeding work with wheat, oats, and barley, and seeding tests with wheat.

In fertilizer trials with wheat superphosphate was the most profitable fertilizer, phosphate was less profitable, and lime, nitrogenous fertilizers, and potassium failed to give profitable increases. Superphosphate, about 1.5 cwt. per acre, was most profitable for oats.

Under the conditions suitable forage crops may be profitably substituted for the usual bare fallow preceding grain. Oats seemed the best for this purpose. To combat "take-all," oats appeared more suitable to precede wheat than either barley or rye. Green manuring was unprofitable with wheat and oats for grain.

Alfalfa grown under irrigation (E. S. R., 50, p. 829) gave the greatest yield in cutting tests on a plat in which the crop was cut when one-tenth in bloom. Such hay is of good quality but not so fine as hay cut before blooming. Hunter River, an acclimated Australian sort, seemed satisfactory in the section. Soluble phosphates, soil amendments, and stable manure, particularly when used with lime, were found effective in fertilizer trials with alfalfa, while nitrogenous and potassium fertilizers were unprofitable.

The reaction of certain grasses to chinch-bug attack, W. P. HAYES and C. O. JOHNSTON (*Jour. Agr. Research [U. S.], 31 (1925), No. 6, pp. 575–583*).—About 100 grasses were subject to chinch-bug attack at the Kansas Experiment Station during the summer of 1924.

The several species showed different degrees of resistance to injury, and later some of them exhibited marked ability to recover from the attack. Native perennial species with harsh tissues, which comprise about 80 per cent of the native prairie grasses of Kansas, were able to survive chinch-bug injury and seemed to show the most marked ability to recover. The majority of tender grasses were either severely injured or completely killed. No correlation was apparent between habit of growth (i. e., whether the plants are tufted or bunched) and the degree of injury and recovery, nor was correlation seen between habitat and degree of injury.

Alfalfa in Manitoba, S. J. SIGFUSSON (*Canada Dept. Agr. Bul. 54, n. ser. (1925), pp. 22, figs. 6*).—Information on production, harvesting, and management practices with alfalfa, as well as on varieties, is based on experiments at the Brandon Experimental Farm and observations in the Province. Alfalfa consistently outyielded other hay crops on the farm and was not surpassed in quality or in feeding value. It has been outyielded by brome only in the driest years.

In an experiment on the influence of preceding crops the highest yields were had by seeding down alfalfa on summer fallow and on corn land, and a good catch was always obtained. Grimm and Baltic appeared at least equal in agricultural value, either being suitable for Manitoba conditions. Early (May 15) seeding and rates of from 7.5 to 10 lbs. of seed per acre have given highest acre yields. Seeding alfalfa with a nurse crop gave practically as good results as seeding alone, and was much more economical. Wheat seemed more satisfactory as a nurse crop than oats or barley, and for best results should be sown at a lower rate (1 bu. per acre) than when sown alone. While alfalfa seeded in intertilled rows has given remarkable yields, its disadvantages in successive years do not recommend the practice where ordinary seeding succeeds and the crop is for hay.

In comparison of methods of breaking sod, plowing in May and working as summer fallow has produced the most wheat, but less economically, and not nearly enough to compensate for the loss of hay, whereas plowing in July after the crop is removed and backsetting in September yielded enough to pay for the extra work and was more effective in destroying the alfalfa.

The behavior of alfalfa seeded with timothy, western rye, brome, and meadow fescue in mixtures is described briefly.

Peculiar morphological characteristics of the stalks of barren corn plants, G. H. Collins (*Jour. Amer. Soc. Agron., 17 (1925), No. 10, pp. 618, 619*).—According to this contribution from Clemson Agricultural College, the grooves normally appearing on every internode of the culm of the plant just beneath the sheath are entirely absent on true barren corn plants, and the accompanying bud, which normally arises from the node at the base of each groove, is also absent. On the whole, true barren plants grow much taller and more erect and appear much sturdier than do plants bearing ears.

Curing and storing of seed corn, J. R. Duncan and A. R. Marston (*Michigan Sta. Quart. Bul., 8 (1925), No. 2, pp. 66–68*).—Kiln drying at 112° F. considerably lowered the germination of seed corn gathered in the milk and soft dough stages as compared with air drying, whereas corn in the hard dough stage did not seem to be affected. The subsequent yields of marketable ears showed a similar trend. Increased germination and yield accrued from drying at 95° as compared with 112°. Lowering the temperature and prolonging the drying period reduced the damage caused by the use of artificial heat. Comparisons of corn in the milk and soft dough stages air-dried in the laboratory at 68° and the outdoor-dried check indicated that corn harvested in early maturity stages and dried slowly in a moderate temperature (68°) will retain its germinability and yield equally as well as corn dried outdoors.

Report on cotton culture in Morocco in 1924, G. Cable (*Rapport sur la Culture du Coton au Maroc en 1924. Paris: Assoc. Coton. Colon., 1925, pp. 84, pls. 6, figs. 2*).—Conditions involved in cotton culture in Morocco are compared with those of important cotton countries, and the status of native production and the results of varietal, cultural, and selection tests with the crop are reviewed. The prospects of the industry in Morocco are considered, and measures are suggested to assure its development. The major problems are environmental limitations, seed supply, cultural methods, and preparation of the fiber.

Mustard: A crop and a weed [trans. title], F. Merkenschlager (*Landw. Jahrb. Bayern, 14 (1924), No. 6–7, pp. 173–270, figs. 78*).—This monograph treats in detail the nutritional physiology of mustard (*Brassica* [*Sinapis*] *alba, B. arvensis*), and gives an extensive discussion of the seed and seedlings, the morphology and anatomy of the plant, the pathology of *B. alba*, the flower and fruit, and the industrial application and properties of the oil.

Oat improvement in the western half of the United States, T. R. Stanton and F. A. Coffman (*Abs. in Jour. Amer. Soc. Agron., 17 (1925), No. 10, pp. 640, 641*).—Marked improvement in oats for the four oat-growing areas west of the ninety-sixth meridian has been effected by introducing varieties from other countries, the most notable of such varieties being Kherson or Sixty-Day oats for the Great Plains area; Swedish Select, Victory, and Golden Rain oats for the intermountain and irrigated regions, and also for the Columbia River basin and Pacific coast region of Oregon and Washington; and Sunrise oats for central California. Notable among the pure line selections for the western United States are Albion, Richland, Gopher, Nebraska No. 21, Iowar, Idamine, Colorado No. 37, and Markton.

Observations on the blooming of orchard grass flowers, T. K. Wolfe (*Jour. Amer. Soc. Agron., 17 (1925), No. 10, pp. 605–618*).—Twenty-two heads

of orchard grass (*Dactylis glomerata*) were under observation at the Virginia Experiment Station during a portion of their blooming periods, 5,861 flowers being studied during the actual process of blooming.

From the beginning of opening of the flowers until they were completely opened averaged 15 minutes. The lapse of time from the beginning of opening until the anthers became pendant averaged 37.5 minutes and until the flowers closed 2 hours 26 minutes. On the average 6.7 days were required for all the flowers on a single head to bloom and 13.5 days for all flowers on a single plant. Of all the flowers observed, 76.9 per cent bloomed from sunrise to noon, 6.6 from noon to sunset, 0.3 from sunset to midnight, and 16.3 per cent from midnight to sunrise. The peak of the blooming occurred between 8 and 9 a. m.

As a rule, the first flowers to bloom on a head are in the apex, but no definite order seems apparent in the other parts of the head. In a single spikelet the first or lowest flower blooms first, followed in order by the second, third, etc., at intervals of about 30 hours.

Branching of rice plants, J. W. Jones (*Jour. Amer. Soc. Agron., 17 (1925), No. 10, pp. 619–623, fig. 1*).—Branching, i. e., the production of shoots at the nodes on the main and secondary culms of rice, is quite common under certain conditions in early maturing varieties at the Biggs Rice Field Station, and in California is most intimately connected with early maturity and ample space for plant development. Because of their later blooming, branch panicles may be used as male parents in hybridizing early- and late-maturing rice varieties. Main and branch panicles on the same plant may differ with respect to a given character. Branch panicles tightly inclosed in a leaf sheath often set seed, indicating that opening of the glumes is not essential in the pollination of rice. Branches have also been observed on several native and introduced grasses at this station.

Pollination and the flower of rice, P. A. Rodrigo (*Philippine Agr., 14 (1925), No. 3, pp. 155–171, pls. 2, fig. 1*).—Under conditions at Los Banos the flowers of the Binicol, Inintiw, and Binangbang varieties of rice were found to open and to be pollinated on the same day. They remained open, on the average, from 48 to 55 minutes. The flowers opened in the forenoon, generally between 9 and 11.30 a. m., and very infrequently between 6.25 and 9 a. m. and between 11.30 a. m. and 12.30 p. m. From 6 to 7 minutes were required before the glumes were fully extended. The flowers in a panicle may all open within from 5 to 10 days. Dehiscence of the anther and pollination in most cases occurred simultaneously with the opening of the glumes in these varieties. In a few flowers dehiscence and pollination took place after opening.

Natural cross-pollination, estimated to be at least about 2.4 per cent, occurred among the flowers of plants bagged together. Hybrid seeds produced through emasculation were deformed at the tip but germinated well in agar solution containing some nutrient solution.

Soybeans, W. E. Ayres (*Mississippi Sta. Bul. 227 (1925), pp. 39, figs. 15*).—Cultural and field methods and harvesting practices considered suitable for the production of soy beans in the Delta region of Mississippi are outlined, and the uses of the crop and the characteristics of important varieties are described. Control methods are indicated for diseases and insect pests. Considerable of the information and data was obtained in planting, cultural, companion cropping, varietal, and harvesting experiments made at the Delta Substation (E. S. R., 51, p. 134).

The nodule bacteria of soybeans, I, II, W. H. Wright (*Soil Sci., 20 (1925), No. 2, pp. 95–130, figs. 10; pp. 131–141, figs. 2*).—Two papers are presented.

I. *Bacteriology of strains.*—A morphological, serological, cultural, and physiological investigation of eight strains of *Pseudomonas radicicola* of *Soja max* carried on at the Wisconsin Experiment Station seemed to indicate that there are two biotypes among the strains studied. They appeared to be identical morphologically but not the same culturally or physiologically.

II. *Nitrogen-fixation experiments.*—Different varieties of soy beans did not receive the same benefit when inoculated with a type B strain of *Pseudomonas radicicola* as with a type A strain. In greenhouse and field tests, plants inoculated with type A strains fixed more nitrogen than those with type B strains. The size, number, and distribution of nodules produced by type A differed from those of type B, the differences being more apparent with inoculated seed than when bacteria were mixed in the soil. The fact that the type A strains fixed more than twice as much nitrogen as the type B strains seems of considerable practical importance. These observations and those noted above show two distinct varying biotypes in six strains of nodule bacteria studied. Although considerable variability occurs among the legume bacteria, the differences between these types have persisted throughout the changes in environmental factors.

Electrocultural experiments with sugar beets [trans. title], O. MUNERATI (*Nuovi Ann. Agr.* [*Italy*], *4* (*1924*), *No. 1, pp. 79–86, figs. 2*).—Sugar beets electrified during growth by the Paulin antenna method had a higher average weight and sucrose content than those on control plats. Beets in plats with underground wires averaged 261 gm. with 14.38 per cent sucrose and their controls 223 gm. and 14.01 per cent, while beets treated by means of overhead wires averaged 237 gm. and 14.71 per cent and their controls 235 gm. and 14.15 per cent.

Difference in internode lengths between, and effect of variations in light duration upon, seedlings of annual and biennial white sweet clover, A. J. PIETERS (*Jour. Agr. Research* [*U. S.*], *31* (*1925*), *No. 6, pp. 585–596, pls. 6*).—The internodes of the annual white sweet clover were observed to be longer than those of the biennial in comparative plantings at Arlington, Va. This was most marked in seedlings grown out of doors in late summer and then sufficed to distinguish the two types. When the two types were compared in the greenhouse, under a short or a long day the differences tended to disappear, and controlling the period of illumination could not be recommended as useful in this case, although Oakley and Westover (E. S. R., 45, p. 631) employed it with alfalfa varieties.

Seedlings of *Melilotus indica* did not differ in their response to normal and short day, whereas under long day the plants bloomed and fruited when only 93 days old and barely 9 to 11 cm. long and the leaflets were smaller than under the normal day, this being in harmony with the field behavior of the plant.

Handbook on Deli tobacco culture, D. J. SANDERS (*Handleiding voor de Deli-Tabakscultuur. Amsterdam: J. H. de Bussy, 1924, pp. XI+346, figs. 115*).—A detailed exposition of the tobacco industry in the Deli district of Sumatra, discussing environmental and labor conditions, and describing seed-bed control, cultural methods and field practices, seed selection, diseases, harvesting, curing, fermenting, and preparation for the market.

High-nicotine tobacco (*New York State Sta. Rpt. 1925, pp. 20, 21*).—Considerable differences in nicotine content were observed in *Nicotiana rustica* from different sources and also among individual selections. The nicotine content was again found higher in topped than in plants not topped. Broadcast plantings were low in nicotine, whether highly fertilized with nitrogen or not. Dried blood and ammonium sulfate but not sodium nitrate seem to have increased

nicotine to a small extent. Strains of the Pryor variety (*N. tabacum*) contained twice the amount of nicotine found in the previous year (E. S. R., 52, p. 534).

Some further remarks on tobacco cultivation for nicotine, J. V. Cutler, J. J. Theron, and J. du P. Oosthuizen (*Union So. Africa Dept. Agr. Bul. 2 (1925), pp. 23, fig. 1*).—Additional studies in South Africa on the plant of *Nicotiana rustica* and on the effects of fertilizers on its nicotine content are reported, supplementing other work (E. S. R., 49, p. 36; 54, p. 134).

Concerning the culture of *N. rustica* as a commercial source of nicotine in Transvaal and the Cape Province, with favorable conditions as many as three crops can be taken from the same plants, each crop yielding from 1,000 to 4,000 lbs. of material. The nicotine content of the crop will depend chiefly upon the percentage of leaf present and the frequency of topping, and perhaps, fertilizers. Entire plants grown at Potchefstroom and Rustenburg showed nicotine contents of from 2.79 to 4.79 per cent and those grown in the Cape Province from 1.64 to 1.78 per cent. Four per cent is considered as a fair average for plants grown under normal environmental conditions.

The leaf contains most of the nicotine present in the plant, averaging about 7 per cent, the stalk about 1 per cent, and the pods, roots, and seeds minor quantities. Selection seems to be the most promising method of increasing the percentage of leaf produced and its nicotine percentage. As the plant matures the nicotine content of the leaf increases up to a certain stage, after which it decreases rapidly. The crop should be harvested at the stage of maximum nicotine content, which can be readily determined.

Of cultural treatments intended to increase the nicotine yield, topping gave the best results, conserving the nicotine and inducing new leaf and, to some extent, new nicotine formation. Marked benefits either in the percentage of nicotine per plant or in the nicotine yield per acre were not obtained by heavy applications of nitrogenous fertilizers, but noticeable benefits accrued from the use of complete fertilizers at Potchefstroom. The plant should be killed as soon as possible after cutting, flue curing being the most effective for this purpose, with green curing nearly as good and probably most economical.

A study of fertility in certain varieties of common wheat with respect to anther length and amount of pollen in parents and offspring, E. Cahn (*Jour. Amer. Soc. Agron., 17 (1925), No. 10, pp. 591–595*).—A study of the number of pollen grains, length of anthers, and fertility of spikelets under field and greenhouse conditions in Marquis, Kota, Red Bobs, and Quality wheat, made at the North Dakota Experiment Station, demonstrated that a difference exists in the amount of pollen produced in different wheat varieties. Length of anthers seems to be closely related to the pollen-bearing capacity. No difference in fertility due to lack of fertilization could be established under field conditions. The greenhouse results showed that wheat varieties behave differently under adverse conditions, producing nearly complete sterility in one variety (Kota), while other varieties are completely fertile. A relation between fertilization of florets and pollen-bearing capacity might be used as a basis for selection.

Winter wheat studies in Montana with special reference to winter killing, I. J. Jensen (*Abs. in Jour. Amer. Soc. Agron., 17 (1925), No. 10, pp. 630, 631*).—In a study of the dormancy period of winter wheat at the Montana Experiment Station, soaking samples for various periods (10 minutes to 48 hours) and then freezing them for 1, 2, 3, and 4 hours at −4° C. (24.8° F.) produced little or no effect upon the subsequent vegetative growth under greenhouse conditions. When the moisture content of the seed exceeded 25 per

cent, the survival under sudden freezing and thawing for any temperature and length of time was greatly reduced, and freezing tended to delay any possible germination. The duration of the freezing period did not affect survival as much in proportion as the length of the soaking period.

Field studies on similarly treated wheat demonstrated that the shorter periods of soaking (10 minutes to 2 hours) did not materially decrease the survival, whereas only a few plants survived when the seed were soaked for more than 4 hours. Montana 36 showed a lesser tendency toward culm formation than Turkey wheat. The treatments did not show an appreciable effect upon culm formation in either greenhouse or field experiments.

Protein survey of 1925 Minnesota wheat crop, R. C. SHERWOOD (*Minn. Dept. Agr. Bul. 45 (1925), pp. 15, figs. 3*).—Hard red spring wheat (683 samples) ranged from 8.7 to 15.7 per cent of crude protein, averaging 11.67 per cent, as compared with 11.5 per cent in the 1924 survey. The highest protein sections of the State were found in the region bordering upon the Minnesota River, from the east-central portion of the State to the west State line. The hard winter wheat (56 samples) averaged 11.63 per cent protein, an increase of 1.45 per cent over 1924, and the 14 durum samples averaged 12 per cent.

The North Dakota bread wheat crop of 1925, C. E. MANGELS (*Northwest. Miller, 143 (1925), No. 14, pp. 1426, 1427, figs. 2*).—A survey by the North Dakota Experiment Station showed the 1925 wheat crop of the State to be very satisfactory as to quality, the protein content averaging about 1 per cent higher than that of the 1924 crop. The test weight and grade were also good. While the protein content was not as high as in 1921 or 1923, the crop was much more satisfactory in milling than those of 1921 or 1923. A few baking tests on the 1925 wheat crop indicated that the gluten quality was satisfactory.

HORTICULTURE

A survey of investigations by American horticulturists on carbohydrate-nitrogen relations, H. D. HOOKER (*Jour. Pomol. and Hort. Sci., 5 (1925), No. 1, pp. 34–42*).—A comprehensive discussion of the present status of American investigations upon this subject.

The vegetable industry of Pennsylvania, C. R. MASON (*Penn. Dept. Agr. Bul. 408 (1925), pp. 142, figs. 35*).—A general survey of the industry, with suggestions for improvement.

Some physiological aspects of Asparagus officinalis, V. A. TIEDJENS (*Amer. Soc. Hort. Sci. Proc., 21 (1924), pp. 129–140*).—Individual plant records taken at the Massachusetts Market Garden Field Station for four years upon 1,170 Martha Washington asparagus plants showed significant differences in yield. That this variability was due in part at least to genetic factors was indicated in a decided uniformity in the number of buds produced from year to year in a large number of plants. The influence of sex on yield was shown in a 25 per cent larger production in staminate than in pistillate plants, partly explained by the exhausting effects of seed production in the pistillate forms. The pistillate plants produced a larger percentage of high-grade stalks and were apparently longer lived than the staminate plants.

A careful study of roots showed that the buds are apparently formed the season previous to their development into marketable stalks, the size of the stalks and the number being undoubtedly influenced by food reserves stored the previous season. Temperature in the spring season apparently did not affect the time of appearance of the stalks, but did influence the rate of growth.

Rhubarb growing in France [trans. title], C. ABRIAL (*Min. Com. et Indus., Off. Natl. Matières Vég. [France], Not. 21 (1925), pp. 12, pls. 2*).—General information concerning varieties, propagation, soils, and culture.

Sex expression in spinach, J. T. ROSA (*Hilgardia [California Sta.], 1 (1925), No. 12, pp. 259–274, figs. 6*).—Of four types of sex found in commercial spinach varieties, namely, extreme male, vegetative male, monoecious, and female, the vegetative male and female plants are deemed most desirable both from the biological and the horticultural viewpoint. The extreme male was characterized by small size, absence of leaf development toward the tip of the flowering stalks, and early maturity, while the vegetative male plant resembled the female in size, vegetative vigor, and time of maturity. Monoecious plants were relatively rare and represented various sex intergrades, but from records taken on various commercial stocks apparently replaced the female in the sex ratio. Female plants were large vegetatively, vigorous, and slow to mature.

That the production of the two male types and the monoecious type are due to inherent factors was shown in genetic studies. For example, a cross between a selected female plant and a male taken from a strain producing vegetative males only resulted in female and vegetative male progeny. Furthermore, the roguing of a Prickly Seeded strain for three seasons resulted in the elimination of the extreme male type. Selfed monoecious plants yielded an unusual proportion of monoecious progeny having the same degree of maleness and femaleness as their parents. Furthermore, it was noted that certain spinach strains contained no monoecious individuals.

Attempts to influence the sex ratio by external treatments such as modifications in soil fertility, shading, spacing, date of planting, and pruning were generally ineffectual. A slight increase in female plants obtained as a result of thinning is believed due to the natural selection of the females because of their greater vigor and size.

Paper mulches for the tomato [trans. title], HATT (*Gartenwelt, 30 (1926), No. 2, pp. 23, 24*).—Records taken at Weihenstephan, Bavaria, upon staked and unstaked tomato plants mulched with tar and tar-free papers gave evidence that tar-free paper is effective in increasing yields, while tar paper is neither better nor worse than ordinary culture.

The effect of pruning and staking upon production of tomatoes, R. MAGRUDER (*Amer. Soc. Hort. Sci. Proc., 21 (1924), pp. 270–273*).—Records taken on staked tomato plants pruned to 1, 2, and 3 stems showed that pruning and staking as compared with ordinary culture increased the yield of fruit during the first four weeks of bearing and materially increased the size of the individual tomatoes. The total yield per plant was decreased in proportion to the severity of the pruning. However, the differences between the several types of pruning were not large enough to warrant the use of any except the single stem, the least expensive type.

Witloof culture, H. VAN AKEN (*Whitefish, Mont.: Author, 1925, pp. 64, pls. 8, figs. 18*).—A handbook dealing with the culture and forcing of witloof chicory.

[Activities of] the fruit branch (*Canada Min. Agr. Rpt. 1925, pp. 105–112*).—Herein are presented brief notes concerning the production of fruit and vegetables in the various Canadian provinces during the year 1924, and information concerning inspection activities and the carrying out of the Fruit Act and the Root Vegetables Act.

[Horticultural investigations at the New York State Station] (*New York State Sta. Rpt. 1925, pp. 21, 31, 43, 44*).—Studies on the nutrient requirements of French crab seedlings growing in the greenhouse in sand cultures

indicated the possibility of vigorous growth under a considerable range of nutrient treatments. Low concentration of nutrient ions maintained at a constant level favored the best top and root development. Suggestive of the high variability in seedling stocks was the great difficulty in selecting 300 comparable plants from a 5,000 population.

A comparative test of the adhering capacity of sulfur applied as dust and as spray to orchard foliage showed the spray to be much more adherent. Humidity first and temperature second were found to be the most important of the various factors affecting the volatility of nicotine from tobacco and hydrated lime dusts.

Grape fertilizer studies at Fredonia, Urbana, and Hudson indicated that nitrogen is the only material to return a profit. Continued observations on apple trees propagated from buds and from grafts showed no differences whatsoever correlated with the method of propagation. Furthermore, no differences could be determined between Rome Beauty trees propagated from high- and from low-producing parents.

Guide to the horticultural work of the Hudson Valley fruit investigations, H. B. Tukey (*New York State Sta. Circ. 79 (1925), pp. 8, figs. 6*).—Herein is offered brief information relative to the location and character of various pomological investigations conducted by the New York State Station in the Hudson River Valley.

Orchard heating in California, W. R. Schoonover and R. W. Hodgson (*California Sta. Bul. 398 (1925), pp. 3–69, figs. 14*).—A manual of instruction in orchard heating prepared in cooperation with F. D. Young of the U. S. D. A. Weather Bureau for the use of California fruit growers.

Because of the expense involved, orchard heating is said to be justified only in those orchards in which the average value of the crop is in excess of the total cost of frost protection. It was observed that heating is most successful on clear, calm nights, when atmospheric conditions are such that there is a relatively thin layer of below-freezing air near the ground, with a warmer layer above, tending to confine the beneficial effects of the heaters to the cold zone.

Of the various types of heaters which have been developed, none has exactly met the requirements. However, several types of smaller stoves, when used in sufficient number per acre and distributed throughout the orchard, have given good results. The importance of having sufficient fuel and heaters to maintain the heat during long dangerous periods is stressed. Accurate thermometers are absolutely essential to prevent unnecessary firing and to indicate the efficiency of the heaters when in operation.

Community organizations are favored as means of reducing initial investment costs and furthering the distribution of essential information, etc.

Cultivation of the apple in Canada, M. B. Davis (*Canada Dept. Agr. Bul. 55, n. ser. (1925), pp. 51, pl. 1, figs. 21*).—Similar to that prepared for the plum (see p. 539), this pamphlet contains general information on the planting of apple orchards, their culture, and management, together with lists of varieties recommended for various parts of Canada.

The propagation of apple varieties by cuttings, C. F. Swingle (*Science, 62 (1925), No. 1615, p. 544*).—In connection with a previously noted article (E. S. R., 53, p. 843), the author reports the successful rooting of cuttings taken from four apple varieties, namely, Buckskin, Springdale, Northern Spy, and Buckingham. Root rudiments were more or less evident on each cutting at the time of detachment from the tree.

New apple varieties, R. E. Loree (*Michigan Sta. Quart. Bul., 8 (1925), No. 2, pp. 61, 62*).—Of many new varieties of apples tested at the station, none pos-

sessed sufficient outstanding qualities to deserve general trial. The Westchester and Scoharie, varieties received from the New York State Station, possessed some merit for home uses, but the Cortland was deemed unpromising for Michigan.

Spraying and dusting experiments with apples in 1924, P. J. PARROTT, H. GLASGOW, and F. C. STEWART (*New York State Sta. Circ. 78* (*1925*), *pp. 16*).—This, the third report (E. S. R., 51, p. 41) upon experimental work carried on at North Rose, Geneva, and Hall upon the control of apple pests with various dusts and sprays, presents tabulated data on results secured in the 1924 season.

Water absorption of pear wood, A. K. GHAMRAWY (*Amer. Soc. Hort. Sci. Proc., 21* (*1924*), *pp. 90–93*).—Records taken at the University of California, with the aid of a manometer, upon the amount of water absorbed by the cut ends of pear branches during the period from November 13 to May 20, 1924, showed that, although much reduced during the winter, the capacity of the pear tree to absorb water was never entirely lost. No evidence was obtained to indicate that a positive sap pressure existed at any time during the period of the study. That water intake is dependent upon imbibition as well as upon osmosis was indicated in laboratory studies with live and killed twigs, the latter absorbing more moisture than the living material.

The distribution of iron in chlorotic pear trees, Y. MILAD (*Amer. Soc. Hort. Sci. Proc., 21* (*1924*), *pp. 93–98*).—Analyses made at the University of California of various parts of chlorotic and normal pear trees growing in calcareous soils indicated that chlorosis is not due to a lack of iron within the tree, but rather to an unavailability of the iron after absorption. Although no regularity was found in the distribution of the iron in the tree, irregularities were more marked in chlorotic trees. In the trunk and main root the chlorotic tree contained higher percentages of iron in the dry matter than did the same parts of normal trees.

Pruning peach trees, F. P. CULLINAN (*Hoosier Hort., 8* (*1926*), *No. 1, pp. 5–10, figs. 2*).—In discussing the pruning of the peach, the author reports that work in progress by the Indiana Experiment Station indicates that heavy pruning of young trees results in dwarfing and retardation of profitable production. With mature trees, renewal pruning should consist in the shortening back to strong lateral limbs and in rare cases the removal of entire branches rather than in drastic dehorning.

Plum culture, W. T. MACOUN (*Canada Dept. Agr. Bul. 45, n. ser.* (*1925*), *pp. 74, figs. 13*).—A general survey of the plum-growing industry in Canada, pointing out varieties suitable for various localities in the Dominion, and, in addition to general cultural information, presenting descriptions of a large number of varieties. The following papers are included: Fertilizers for the Plum Orchard, by F. T. Shutt (pp. 56–58); Diseases of Plums and Their Control, by H. R. McLarty (pp. 63–69); and Insects Affecting Plum Trees (pp. 70–74).

Productive small fruit culture, F. C. SEARS (*Philadelphia and London: J. B. Lippincott Co., 1925, 2. ed., rev., pp. IX+368, pl. 1, figs. 196*).—This is a revised edition of a previously noted work (E. S. R., 43, p. 40).

The Queensland raspberry (Rubus probus), a species adapted to tropical conditions, J. P. GRIFFITH (*Jour. Dept. Agr. Porto Rico, 9* (*1925*), *No. 1, pp. 29–45, figs. 8*).—The information herein presented has been noted largely from another source (E. S. R., 53, p. 843).

Propagation of grape vines (*Ohio Sta. Bimo. Bul., 11* (*1926*), *No. 1, pp. 35, 36, fig. 1*).—Information of a practical nature is presented on the method of taking and handling cuttings, with a few words on the process of layering.

The distribution of the date palm, P. Popenoe (*Geogr. Rev., 16 (1926), No. 1, pp. 117–121*).—Based on a survey of available literature, the author estimates the existence of approximately 90,000,000 date palms in the entire world. More than half of these are thought to be located in the countries bordering on the Persian Gulf.

Overhead irrigation as a citrus frost protection, F. D. Young (*Citrus Leaves, 5 (1925), No. 11, pp. 1–3, figs. 4*).—Overhead sprinkling of orange trees in an attempt to protect from frost injury was wholly unsuccessful, the trees breaking down under the weight of the ice, despite the fact that the temperature of the water leaving the nozzles was 54° F., the outside temperature 27 and 28°, and the water was able to raise the air temperature from 2 to 3° above that of the surrounding area.

Bud selection in Washington Navel orange.—V, Progeny test of a Sheepnose limb variation, A. D. Shamel, C. S. Pomeroy, and R. E. Caryl (*Jour. Heredity, 16 (1925), No. 12, pp. 449–455, figs. 4*).—A further report upon citrus propagation studies (E. S. R., 54, p. 445). Progeny of the so-called Sheepnose strain, deemed undesirable on account of the off shape and small size of the fruits and the inferior quality of the juice, bore fruits and foliage similar to the parent branch, indicating the heritability of the sporting characters and the desirability of careful selection of budding wood in order to avoid the propagation of this and other inferior types.

Satsuma oranges in northern and western Florida, H. G. Clayton (*Fla. Univ. Agr. Ext. Bul. 41 (1925), pp. 18, figs. 8*).—Herein are presented directions for the culture, pruning, spraying, and harvesting of the Satsuma orange.

Philippine citrus fruits, A. H. Wells, F. Agcaoili, and M. Y. Orosa (*Philippine Jour. Sci., 28 (1925), No. 4, pp. 453–527, pls. 6, figs. 2*).—A general survey of the citrus-growing industry in the Philippine Islands. Despite the fact that approximately 800 types of citrus, introduced and native, are found in the islands, and that many localities are very favorable for its culture, large quantities of citrus and citrus products are imported, and in no locality has the industry reached a high degree of development. The results of chemical analyses of the fruits of 41 forms of citrus are presented.

Tea culture, [K. E.] Kempski (*Die Teekultur. Berlin: Paul Parey, 1923, pp. 59, figs. 38*).—Concerned especially with the conditions obtaining in the Dutch East Indies, the author discusses methods of culture, pruning, harvesting practices, drying, and general preparation for market.

Memorial book on Dutch East Indies tea culture (*Gedenkboek der Nederlandsch Indische Theecultuur, 1824–1924. Weltevreden: Proefsta. voor Thee, [1924], pp. XIV+241, pls. 46, fig. 1*).—Herein are presented papers by various authors dealing with the history, development, and present status of tea production in the Dutch East Indies.

Proceedings of the Tea Congress held at Bandoeng, Java, in June, 1924 (*Handelingen van het Thee-Congres met Tentoonstelling, Bandoeng, 1924. Weltevreden: G. Kolff & Co., [1924], pp. VII+369, pls. [19], figs. [97]*).—Among the papers presented are the following: Tea Industry in Formosa, by I. Tanabe (pp. 110–118); Tea Law of the United States, by G. F. Mitchell (pp. 158–161); and The Selection of the Tea Plant [trans. title], by C. P. Cohen Stuart (pp. 359–367).

Picturesque America, its parks and playgrounds, edited by J. F. Kane (*New York: Resorts and Playgrounds of Amer., 1925, pp. 521, pls. 6, figs. 624*).—An illustrated volume with special articles contributed for the park and playground sections and numerous selections from the works of well-known authors expressing the varied appeal of the outdoors in America.

FORESTRY

Statistical methods in forest-investigative work, W. G. Wright (*Canada Dept. Int., Forestry Branch Bul. 77 (1925), pp. 36, figs. 3*).—Pointing out the value of statistical methods in the interpretation of the results of forestry investigations involving the use of quantitative data, the author herein presents various formulas and briefly discusses their application and use to forestry problems.

Instructions for national forest range plant work, 1925 (*U. S. Dept. Agr., Forest Serv., 1925, pp. 4*).—Remarking upon the value of an accurate knowledge of the edible and poisonous plants growing on the forest ranges, this pamphlet presents concise directions for gathering, preserving, and shipping herbarium specimens.

The college forest nursery, A. K. Chittenden (*Michigan Sta. Quart. Bul., 8 (1925), No. 2, pp. 79, 80*).—The operation of the college forest nursery is briefly discussed, and suggestions are given for planting stock and managing young plantations.

First annual report, Commission of Forestry, State of Alabama, 1924, P. S. Bunker (*Ala. State Comn. Forestry Ann. Rpt., 1 (1924), pp. 61, figs. 21*).—As a result of the forestry act of 1923, providing for the establishment of a State commission of forestry, there is presented the first annual report, containing, in addition to administrative information, a list of native trees under their common and scientific names.

Forests and agriculture, E. I. Kotok (*Calif. Countryman, 12 (1925), No. 3, pp. 7, 25, figs. 2*).—Briefly outlining the present status of forestry in California, the author stresses the need of reducing fire losses, which in 1923 and 1924 were so severe as to place California in the position of being the worst fire State in the Union.

Common forest trees of Florida: How to know them, W. R. Mattoon (*Jacksonville: Florida Forestry Assoc., 1925, pp. 96, figs. 93*).—Conforming to pamphlets prepared for other States (E. S. R., 53, p. 41), this illustrated manual contains material useful in the identification of forest trees and shrubs found in Florida.

Growth of Pinus resinosa and Pinus strobus, D. J. Cashen (*Mich. Acad. Sci., Arts, and Letters, Papers, 3 (1923), pp. 67–86, pl. 1, fig. 1*).—Measurements taken in northern Michigan forests on the growths of *P. resinosa* and *P. strobus*, as depicted in annular rings and distances between the whorls of branches, showed the first-named species to be the more rapid and consistent grower. The optimum and minimum growing environments were apparently the same for both species. The density and condition of pine stands were found to be primarily dependent on the nature of the seeding. No close correlations were noted between the growth of pine trees and total precipitation or temperature. However, in general, years of favorable climatic conditions resulted in good growth. Light, humidity, soil moisture, and the character of the site were also important factors affecting the growth.

Jack pine at East Lansing, P. A. Herbert (*Michigan Sta. Quart. Bul., 8 (1925), No. 2, pp. 81–83*).—Measurements taken in a stand of jack pine (*Pinus banksiana*), established on the college grounds in 1907, showed that in good soil and under good culture this species is capable of making comparatively rapid growth. During the period 1907–1923 the mean annual increment per acre was 90 cu. ft. The average height in 1923 was 25 ft. and the average diameter at 4.5 ft. elevation was 2.8 in. Measurements taken in the thinned and unthinned areas showed that thinning is a profitable practice, there being 86 per cent of high-grade trees in the thinned section, as compared with 65

per cent in the unthinned section. A direct correlation was found between the size of the crown of individual trees and their diameter, height, and crown length.

Artificial regeneration of white spruce, R. W. Lyons (*Jour. Forestry, 23 (1925), No. 12, pp. 1002–1008*).—Based on extended experiences, in the Province of Quebec, in the replanting of pulp-wood areas with white spruce (*Picea canadensis*), a species found valuable on account of its tolerance to shade and resistance to insects and disease, the author recommends that seed be obtained from vigorous trees growing in similar latitude and altitude. In general the 2–2 plants, i. e., two years in the seed bed and two years in the transplant row, were found best. Sphagnum moss was found an excellent supplementary cover for fall planted seed beds, and liberal applications of manure to the seed and nursery beds previous to planting gave excellent results. Extra care spent in planting trees was well warranted by improved growth. From 1,700 to 2,000 trees were planted per acre and gradually thinned, as suppression occurred with advancing age. Direct seeding resulted in scattered stands, and spot sowing was a failure.

Manurial requirements of the basket-willow, H. P. Hutchinson (*Univ. Bristol, Agr. and Hort. Research Sta. Ann. Rpt. 1924, pp. 109–119*).—Suggesting that the exhaustion of the food supply is the major factor in causing decline of willow yields, the author reports the results of studies carried on in the field and in pots to determine the manurial requirements of the plant. In the field investigation no significant beneficial effects followed the use of fertilizers. However, the plants receiving sulfate of ammonia bore greener and longer retained leaves.

With willow cuttings placed in pots of sand of naturally low fertility but supplied with various nutrient combinations, much the better growth was made in the complete nutrient series. Nutrient combinations lacking in potash, calcium, or magnesium were nearly as effective as the complete material. The absence of phosphorus was detrimental to growth but in lesser degree than was the absence of nitrogen, growth in the latter case being comparable to that in the rain water series. Wood produced in the absence of nitrogen failed upon curing to develop a satisfactory color.

Periodical tapping of Hevea (*Malayan Agr. Jour., 13 (1925), No. 11, pp. 342–350, pls. 6*).—This account is in two parts:

I. *The experimental basis of periodical tapping,* J. Grantham (pp. 342–347).—The results of three experiments, in which daily tapping was compared with alternate tapping, showed that in respect to yield alternate tapping, either with 0.5-, 1-, or 2-month periods on one-half of the circumference was equal, and possibly slightly superior, to that of daily tapping on one-third of the circumference. Alternate-period tapping caused fluctuations in the concentration of the latex, which reached a maximum immediately after the rest period and thereafter gradually lowered.

II. *The effect of alternate periods of tapping and resting on the quality of the rubber,* B. J. Eaton and R. O. Bishop (pp. 347–350).—Investigations indicated that periodic tapping affects the time of vulcanization of the rubber. After a long rest period, trees yielded a rubber having a very slow rate of vulcanization, which after three or four weeks became constant and more rapid.

Forest products, 1924: Pulp-wood consumption and wood-pulp production (*Washington: U. S. Bur. of the Census, 1925, pp. 13*).—This pamphlet, compiled in cooperation with the U. S. D. A. Forest Service, contains information on the condition of the pulp-wood industry and statistical data concerning domestic consumption, exports, imports, etc.

DISEASES OF PLANTS

[Plant disease investigations by the New York State Station] (*New York State Sta. Rpt. 1925, pp. 28–30*).—For the control of diseases of cruciferous crops the hot water treatment of seed is recommended. Although this method has been very effective, it is said to be not entirely satisfactory because of the difficulty of application. In a previous publication (E. S. R., 51, p. 152) the black rot organism, *Pseudomonas campestris*, was considered to be unable to live over winter in the soil, but later investigations have shown that it can survive one winter in the absence of living crucifers.

Raspberry disease investigations have included methods for control of mosaic in red and purple raspberries. Wide variation has been found in susceptibility to disease, the rate of spread varying according to the variety, and also probably to the abundance of the carrier aphids. Roguing, as a means of control, is said to have given excellent results.

Complaints are said to have been received regarding a scald of apples occurring in cold storage, in which large sunken areas of dead and discolored tissue appeared. Upon investigation it was found that the trouble was a form of the nonparasitic disease known as deep scald. It was frequently accompanied by a blue-black color of the diseased areas, which was found to be due to the invasion of the infected tissues by *Oospora lactis*.

Breeding experiments for the control of bacterial blight on anthracnose of beans are said to have been successful, crosses between the varieties Michigan Robust and Wells Red Kidney having given new varieties which seemed to be very satisfactory.

An investigation on the dying of fruit trees in the Hudson Valley has been continued, and much of the injury has been found to be due either to winterkilling or to more obscure causes which require further investigation. Parasitic fungi were found to enter into the problem but rarely.

Fusarium as a plantlet disease producer [trans. title], O. APPEL (*Arb. Biol. Reichsanst. Land u. Forstw., 13 (1924), No. 3, pp. 263–303, pl. 1, figs. 4*).—*F. avenaceum*, *F. herbarum*, *F. culmorum*, and *Gibberella saubinetii* cause cereal seedling diseases. Modes and conditions of the attack are outlined. Fusarium injury is favored by growth conditions favorable to the plants.

Present knowledge of mosaic diseases, M. T. COOK (*Jour. Dept. Agr. Porto Rico, 8 (1924), No. 2, pp. 50–54*).—This is a popular discussion.

[The action of Bordeaux mixture], E. W. SCHMIDT (*Centbl. Bakt.* [*etc.*], *2. Abt., 61 (1924), No. 11–18, pp. 356–367*).—The theory, method, and outcome of applications and methods claimed or denied to be directly or indirectly fungicidal or fungus-controlling are presented, with detailed discussion and conclusions.

[Cereal rusts and smuts and their control], A. PETIT (*Ann. Serv. Bot.* [*Tunis*], *No. 2 (1921–1922), pp. 73–92*).—In a brief systematic review of rusts and smuts separately, it is stated that rust is at present practically controllable only through the employment of the principles of genetics. The principles, practices, and results of smut control by different agents are dealt with in tabular form, with brief discussion.

Dry treatment for smut diseases of cereals, K. SAMPSON and D. W. DAVIES (*Welsh Jour. Agr., 1 (1925), No. 1, pp. 169–176*).—Results of some preliminary trials of dry treatment for cereal seeds have been noted (E. S. R., 50, p. 347). More extensive trials were made during the seasons of 1923 and 1924, copper carbonate again giving excellent control of wheat bunt and promising results with barley covered smut. The results are to be published when the data

for 1924 become available. The present paper attempts to survey briefly the already extensive literature that has accumulated within the last seven years on dry treatment for cereal smut diseases. It is considered as evident from the literature that no definite statement can safely be made at present regarding the minimum effective percentage of copper. Covering capacity is significant, as is also the cost of available materials.

Severity of attacks of black stem-rust in Denmark, 1884–1921, H. R. Hansen (*Phytopathology, 13 (1923), No. 9, pp. 404–407*).—Data are presented which are claimed to show material reduction in injury to wheat by black stem rust subsequent to 1903 when barberry eradication in Denmark was made obligatory.

Dust treatments for the control of oat smut, R. C. Thomas and P. E. Tilford (*Ohio Sta. Bimo. Bul., 11 (1926), No. 1, pp. 18–23, fig. 1*).—Preliminary experiments are said to have shown that the carbonates, sulfates, acetates, and stearates of copper and nickel used alone were not efficient in controlling oat smut. Combinations of these salts with corrosive sublimate were tested in 1924, comparisons being made with formaldehyde. The formaldehyde treatment afforded practically perfect control, but the percentage of stand was considerably reduced. The combinations of copper and nickel salts with corrosive sublimate gave commercial control, and the plats were nearly as free from smut as where formaldehyde treatment had been used.

The experiment was repeated in 1925 under field conditions, and the results were in close agreement with those obtained in the plat work.

Summarizing the report, the authors state that they have not found it desirable to change the former recommendations of 3 oz. of powder for each bushel of grain treated. The best results were obtained with copper acetate and corrosive sublimate mixtures. These were followed in close order by the copper sulfate and copper carbonate treatments, to which corrosive sublimate was added. In all these treatments, one part of copper salt was employed to two parts of corrosive sublimate.

Leafspot of maize caused by Ophiobolus heterostrophus n. sp., the *ascigerous stage of a Helminthosporium exhibiting bipolar germination*, C. Drechsler (*Jour. Agr. Research [U. S.], 31 (1925), No. 8, pp. 701–726, pls. 2, figs. 5*).—A description is given of a foliar disease that has been found to occur on maize in Florida and on maize and teosinte in the Philippines, which is characterized by cinnamon-buff lesions considerably smaller and much more numerous than those of leaf blight, and also distinguished by being usually confined to a single intervascular region. The disease is associated with the fungus, which, in its conidial condition, is said to differ from *H. turcicum* in the smaller diameter of its conidiophores, as well as other characters. The fungus causing the disease is described tentatively as *O. heterostrophus* n. sp., though it is not considered closely related to several well-known species of Ophiobolus parasitic on grasses.

The author believes that this leaf spot is probably widely distributed in tropical and subtropical maize-growing regions, having been confused with leaf blight, which occurs in the same territory. It is thought not improbable that one type of tassel mold that has been observed will prove to be identical with the foliar parasite.

Sclerotinia species causing decay of vegetables under transit and market conditions, G. B. Ramsey (*Jour. Agr. Research [U. S.], 31 (1925), No. 7, pp. 597–632, pls. 7, figs. 3*).—A report is given of studies of rots of vegetables caused by species of Sclerotinia, the material for the most part having been collected in the markets of Chicago. The investigations include the determina-

tions of the species involved, the presence of strains of the fungi limited to definite hosts, the temperature relations of the organisms, and the rôle of microconidia in the life history of Sclerotinia.

As a result of experiments with the cultures made from a considerable number of vegetables, it was found that *S. libertiana* was the causal agent of rot in more than 90 per cent of the cases examined. In addition to attacking vegetables, this species may also cause rots of fruits. Inoculation studies showed that in addition to *S. libertiana*, *S. intermedia*, *S. minor*, and *S. ricini* are capable of producing decay of a wide range of vegetables. All of the strains of Sclerotinia examined produced soft, watery, odorless rots of the host plants, and it is claimed that vegetables harvested during wet weather were especially susceptible to infection and decay.

From the wide range of species studied, it did not seem possible to separate strains of Sclerotinia that were limited to certain groups of hosts.

The temperature relation studies showed that infection could be produced at −0.5 to 0° C., *S. intermedia* making most active growth at this temperature. *S. minor* produced more rapid decay of bean pods and other vegetables at 20° than any of the other species. The growth of *S. intermedia* ceased at about 30°, while all the other species continued to grow on potato dextrose agar at 32 to 33°.

Microconidia were formed by all species some time during their development, but the author believes that they do not play an important part in the life history of the fungus.

A fruit rot of chillies, L. S. Bertus (*Ceylon Dept. Agr. Yearbook, 1925, pp. 47–50, pl. 1*).—A fruit rot of chilies shows first as a dirty brown discoloration on the ripening fruit. This spreads rapidly, darkening and apparently soddening the whole fruit surface. Such fruit usually gives upon examination *Gloeosporium piperatum* and *Colletotrichum nigrum*. The perfect stage of the Gloeosporium is claimed to be *Glomerella piperata*, that of *C. nigrum* apparently not being on record. From studies noted the Glomerella found appears to be the perithecial stage of *C. nigrum*. The disease may be controlled under ordinary conditions by the removal and destruction of fruits as they become diseased.

The relation of soil moisture to formaldehyde injury of onion seedlings, P. J. Anderson (*Phytopathology, 13 (1923), No. 9, pp. 392–403, figs. 2*).—On account of reported injury sometimes attributed to the use of formaldehyde for the control of onion smut, the author made a study of the relation of soil moisture to formaldehyde injury to onion seedlings.

It was found that any application of formaldehyde strong enough to control smut was certain to cause some of the seed to fail to germinate. When a concentrated solution 1–50 applied to a 3,000-ft. row was used the injury was found to depend upond the moisture condition of the soil. Injury varies inversely as the percentage of moisture. The amount of injury where formaldehyde is used may be reduced by diminishing the amount of the solution applied per unit of row, but the percentage of smut control is reduced in the same ratio. The amount of injury in a dry soil may be reduced by increasing the dilution of the formaldehyde without at the same time reducing the actual amount of formaldehyde per unit of row. It is claimed that the amount of injury can be predicted from the moisture condition of the soil on the day of planting, and that it is unaffected by weather conditions during the subsequent days.

The author suggests that when the soil is very dry it is not safe for growers to use as concentrated a formula as 1–50–3,000. If the soil is fairly wet, con-

siderable labor and time may be saved by using a more concentrated formula. If the soil is extremely dry and dusty, a dilution approximating 1–128–3,000 is considered the safest for use.

Bacterial scurf of potato [trans. title], C. Stapp (*Arb. Biol. Reichsanst. Land u. Forstw., 13 (1925), No. 4, pp. 413–418, pls. 2*).—No infection of young potatoes was demonstrated.

Study of the developmental history and biology of Hypochnus solani (Rhizoctonia solani) [trans. title], K. O. Müller (*Arb. Biol. Reichsanst. Land u. Forstw., 13 (1924), No. 3, pp. 197–262, pls. 5, figs. 5*).—*H. solani* is able to live saprophytically in soil, developing well under humid conditions, but not when fine sand is the chief constituent. The fungus spreads both horizontally and vertically in soil. Positive chemotropism toward nutritive soil constituents was not observed. Overwintering is aided by the production of sclerotia, but not by means of basidiospores. This organism, as regards potato, injures only the subterranean parts. The mode of attack is outlined.

Physiology of germination of resting bodies of the potato wart organism [trans. title], E. Köhler (*Arb. Biol. Reichsanst. Land u. Forstw., 13 (1924), No. 3, pp. 369–381*).—The rest period of sporangia of *Synchytrium endobioticum* is not altered by previous treatment with lactic or citric acid between concentrations of 1 and 0.125 per cent. Frost was similarly without effect. In compost soil, germination of resting bodies was greatly diminished. Resting bodies developed in like surroundings have almost exactly coincident after-ripening phases.

Phlyctochytrium synchytrii n. sp., a destructive parasite of the resting sporangia of Synchytrium endobioticum [trans. title], E. Köhler (*Arb. Biol. Reichsanst. Land u. Forstw., 13 (1924), No. 3, pp. 382–384, pls. 2*).—A parasitic organism able practically to empty the sporangia of *S. endobioticum* is noted, with brief description, as a new species and named *P. synchytrii*.

Study of potato canker [trans. title], E. Köhler (*Arb. Biol. Reichsanst. Land u. Forstw., 13 (1925), No. 4, pp. 385–411, pls. 5*).—Reaction of potato to the wart or canker organism (*Synchytrium endobioticum*) varies according to the potato variety and the structure and function of the organ attacked. Previous findings were confirmed.

Some experiments on potato leaf-roll transmission in Wales, T. Whitehead (*Welsh Jour. Agr., 1 (1925), No. 1, pp. 184–188*).—In 1923 experimentation was instituted to test for localities where virus diseases spread slowly and where, in addition, other favorable conditions for good potato culture existed, so that such localities, when found and fully tested, might be used for the production of seed potatoes relatively free from such diseases, in preference to depending for seed potatoes upon relatively distant sources, as certain districts in Scotland. The carrying out and results of the tests are outlined. Relatively little spread of leaf roll was observed to occur at Madryn and at Aber in Carnarvonshire, from which fact it is inferred tentatively that unfavorable conditions exist at these places for the production of virus-carrying aphids.

Hypochnus sp. on sugar beet [trans. title], E. Schenck (*Centbl. Bakt. [etc.], 2. Abt., 61 (1924), No. 11–18, pp. 317–322, figs. 8*).—A fungus disease of sugar beets appearing in Magdeburg is described. It shows on young and tender foliage as a fine mycelial network, and later as a veiling on parts of older leaves. The organism was compared with well-known species of Hypochnus, to which genus it is thought to belong.

Morphological similarity between the Pythium-like fungus found associated with diseased sugar-cane roots in Hawaii and Porto Rico, B. A. Bourne (*Jour. Dept. Agr. Porto Rico, 8 (1924), No. 2, pp. 61–70, figs. 8*).—His-

tological investigation of roots of the cane variety B. 6450 in Porto Rico suffering from Pythium root rot has demonstrated that this fungus as it exists in the tissues bears a remarkable morphological similarity to the Pythium-like organism figured by Carpenter (E. S. R., 42, p. 352) as in roots of the Lahaina cane in Hawaii. The iron-alum-haematoxylin cytological stain proved very effective with the Pythium-like thallus in cane roots. The fine cylindrical type of thallus was far more common than were the thick and globular forms, these latter being confined mainly to the outer layer or two of the root cells. Such comparison as has been possible of the oospores from the Porto Rican with those from the Hawaiian organism shows such similarity in size as would possibly permit their being considered as not outside the ordinary variations allowed within a species.

Mosaic investigation at Central Cambalache.—Preliminary report, C. E. Chardón (*Jour. Dept. Agr. Porto Rico, 8 (1924), No. 2, pp. 27–39, figs. 11*).—In this preliminary report it is stated that the records of sugar cane mosaic in Porto Rico begin with Stevenson's account (E. S. R., 38, p. 150), showing rapid spread until in 1919 it had practically covered the island except for the isolated Valley of Yabucoa. Planting the immune Uba and the resistant P. O. J. seedlings saved the industry, but these varieties are not suited to numerous areas.

The practice of planting extensively B. H. 10–12 and S. C. 12–4 in the alluvial soils of the north coast without due precautions against mosaic has become common. Yields have increased greatly, but many of the plantations carry mosaic, and it is feared that the present degree of resistance may not be maintained.

In certain lands near the coast mosaic is held in check by adverse conditions, as yet unknown. It is suggested that these regions be used to establish nurseries of different varieties which in the future may successfully meet a disaster or an emergency.

This preliminary report covers only the first year's experience with mosaic at the Central Cambalache. However, it is stated that in the second year's experimentation in a 26-acre tract tried with 52 varieties, 0.43 per cent of infection was developed. This appears to assure the safety of variety propagation on a large scale in this region.

Sugar-cane leaf spots in Porto Rico, M. T. Cook (*Jour. Dept. Agr. Porto Rico, 8 (1924), No. 2, pp. 55–57*).—Sugar-cane leaf spot diseases, so common and conspicuous that they fail to receive proper attention, include in Porto Rico mosaic and those caused by *Leptosphaeria sacchari* and by *Helminthosporium sacchari*. The so-called Manati disease and the Santa Rita disease (E. S. R., 53, p. 250) are described.

Experiments with "finger and toe" disease of swedes; with a note on loss caused by rabbits, T. Whitehead (*Welsh Jour. Agr., 1 (1925), No. 1, pp. 176–184*).—The present article summarizes further work undertaken in 1922 to test the conclusions arrived at from earlier trials (E. S. R., 49, pp. 148, 445). An account is also given of the distribution of swede finger-and-toe in North Wales.

It appears certain that two swede varieties separated by selection from an extremely susceptible parent possess marked resistance to finger-and-toe, these varieties showing also exceptionally high feeding value. Yellow turnips resist the disease better than do many swedes.

Resistance to finger-and-toe does not appear to be directly related to the dry matter total or to the sugar of the root, and this quality should be tested for in other connections.

Resistant varieties, as selected out, are advantageous, not only on land badly contaminated with finger-and-toe, but on uncontaminated land, being better as regards dry content, feeding value, and keeping qualities, and so overbalance the reduced yield of roots per acre. Rabbits seem to prefer the more resistant varieties, probably on acount of their higher sugar content.

Cladosporium leaf mold of tomato: Fruit invasion and seed transmission, M. W. GARDNER (*Jour. Agr. Research* [U. S.], *31* (*1925*), *No. 6, pp. 519–540, pls. 5, fig. 1*).—A description is given of a stem-end disease of the tomato fruit which is caused by *C. fulvum*, the fungus responsible for the leaf mold of the tomato plant.

The disease is characterized as a conspicuous, black, stem-end rot of both immature and ripe greenhouse tomatoes. The fungus is said to cause also blackened radial furrows in the fruit, and lopsided fruits which tend to remain green or yellow on the retarded side. In an infected fruit the fungus occurs in the pericarp, locule walls, and placentae, in the torus, and frequently in one or more sepals and the last internode of the pedicel. Histological studies and inoculation tests indicate that spore infection occurs rather early through stomata in the sepals, torus, or last internode of the pedicel, after which the mycelium grows down into the fruit, causing a dark discoloration.

The mycelium was found to grow down through the placentae and to invade the seeds both internally and externally. Fragments of infected fruit tissue may also adhere to the seed coat, and under moist conditions contaminate the seeds.

Laboratory studies on the chemotherapy of Peronospora disease [trans. title], W. KOTTE (*Centbl. Bakt.* [*etc.*], *2. Abt.*, *61* (*1924*), *No. 11–18, pp. 367–378*).—From a number of metals and salts, comparative values were obtained of their toxicity to conidia of Peronospora. No substance superior or equal to copper (from the standpoint of agricultural applicability) was found. As a possible substitute for copper, cadmium appears to be the most promising, and after that the alkaline earths and aluminum. Other substances tested gave no promise as protection against Peronospora.

A thread blight on coconuts, T. PETCH (*Ceylon Dept. Agr. Yearbook, 1925, pp. 27, 28, pl. 1*).—Credit is given to G. Bryce for specimens and information of a coconut palm thread blight forwarded from New Guinea, where it occurs on the older leaves, though apparently not killing the midrib, so that the apical part may remain green. The fungus is technically described as the new species, *Corticium penicillatum*.

Observations on the occurrence of bunchy-top disease of plantains, G. G. AUCHINLECK and C. P. CRISPEYN (*Ceylon Dept. Agr. Yearbook, 1925, pp. 33–36*).—Plantain or banana bunchy-top disease, though widespread in Kegalle District for some years, remained but little known, and the present account is that of observations on a trial plat set out in 1923. The tabular results, with discussion thereof, tend to show that in the variety Hondarawala, the most resistant, and in Anamalu, the most susceptible, the percentages of diseased plus dead were 47 and 78 respectively.

In treatment tests, the order of effectiveness that was apparent was Brunolinum and lime, Bordeaux mixture and potassium sulfate, and sulfur and copper sulfate.

Observations on a plot of plantains affected by the bunchy-top disease at Peradeniya, C. H. GADD (*Ceylon Dept. Agr. Yearbook, 1925, pp. 36, 37*).—A plat of manila hemp at the Peradeniya Experiment Station was destroyed by a disease resembling closely, as to symptoms, banana bunchy top. In July, 1921, this plat was planted with plaintains in order to determine whether any connection existed between the disease of manila hemp and plaintain bunchy top.

None of the varieties Hondarawala, Suwandel, Alu-kehel, Kolikuttu, and Surrumundang appeared to be immune, all being about equally susceptible. No clump recovered from attack. Healthy looking suckers eventually sicken and die. The experiment demonstrated the infectious nature of the disease, which probably spreads by way of the soil. Complete eradication and liming are suggested.

Some observations on a witches' broom disease of tea, M. Park (*Ceylon Dept. Agr. Yearbook, 1925, pp. 10–12, pl. 1*).—A witches' broom disease of tea is noted as having been first recorded in 1922, but since that time sent from several districts named, chiefly from Uva, on the drier side of the tea-growing area. A detailed account is given of the symptoms, which correspond to three different types of the disease. The leaves are usually undergrown, mottled green, and yellow, with commonly a mosaic appearance. Cell sap from these leaves failed to develop chlorosis when injected into healthy leaves.

A new disease of cultivated Campanulas due to Sclerotinia sclerotiorum (Massee), J. Rees (*Welsh Jour. Agr., 1 (1925), No. 1, pp. 188–190*).—In July, 1923, cultivated Campanulas were reported as dying off near Cardiff from attacks by a fungus resembling *S. sclerotiorum*. In 1924, *Campanula persicifolia alba* was attacked. It is thought that other Campanula varieties may be locally subject to attack by the fungus, which is known to occur on bean, marrow, cucumber, tomato, sunflower, and artichoke, also in storage on carrot, turnip, and mangel. Methods of control suggested include weeding and avoidance of the copious use of horse manure.

Damping-off of taproots of conifers, A. E. Rathbun (*Phytopathology, 13 (1923), No. 9, pp. 385–391*).—Inoculation experiments of conifer seedlings under control conditions are said to show that *Pythium debaryanum*, *Rheosporangium aphanidermatus*, *Fusarium arthrosporioides*, and *F. sporotrichioides* are very virulent in their attacks on the taproots of young conifers. *Corticium vagum*, *Botrytis cinerea*, *Phomopsis juniperovora*, *Phytophthora* sp., and strains of the moniliform section of Fusarium are said to be able to cause considerable decay of coniferous taproots. *Mucor racemosus*, *Pythium artotrogus*, and certain species of Fusarium are considered nonparasitic.

Organization of the telial sorus in the pine rust, Gallowaya pinicola, B. O. Dodge (*Jour. Agr. Research [U. S.], 31 (1925), No. 7, pp. 641–651, pls. 2, fig. 1*).—The author claims that there is formed by *G. pinicola* a distinct and persistent peridial buffer structure which functions in rupturing the leaf tissues overlying the young sorus and that, following cell fusions, teleutospores are borne in chains. The spores are said to be not sessile in the sense that only one spore is cut off from a basal cell as in Coleosporium, nor does the basal cell bud to form spores as in Puccinia.

The genus Ribes with reference to the white pine blister rust in the West, D. V. Baxter (*Mich. Acad. Sci., Arts, and Letters, Papers, 2 (1923), pp. 1, 2*).—During 1921 the author investigated the occurrence of pine and Ribes with reference to blister rust in the western area, which, as dealt with in this paper, embraces the Great Plains and the Rocky Mountain regions. It was found that an unbroken chain of Ribes links the pines of the Laramie Mountains with those of the Medicine Bow ranges. In northwest Wyoming *Cronartium occidentale* was found on *Ribes aureum*. This find greatly extends the known distribution of this rust, and this fact increases the difficulty of distinguishing *Cronartium ribicola* without inoculation experiments and complicates still further the field work on blister rust.

A leaf-fall disease of Hevea brasiliensis Muell.-Arg. due to Gloeosporium alborubrum Petch, C. D. La Rue and H. H. Bartlett (*Mich. Acad.

Sci., Arts, and Letters, Papers, 2 (1923), pp. 73–90).—From work done largely, it is said, in 1918, it is reported that *H. brasiliensis*, in the rubber plantations of east Sumatra at least, is subject in certain seasons to an abnormal fall of young and apparently healthy foliage. The disease is physiological in the sense that it occurs only under favoring weather conditions and in trees of low vigor, such as those on poor soils.

The leaf fall is attributed to *G. alborubrum*, supposedly identical with *G. heveae*. Under the usual conditions dormant Gloeosporium exists in many Hevea trees. The fall of leaves and young fruits appears to be caused by the growth of the mycelium from the older tissues into new parts. Primary infection from spores appears to cause the condition characterized as tip and margin leaf disease, which may eventuate in twig disease. Inoculation of Hevea cuttings, in damp chambers, with Gloeosporium spores causes severe rotting of all young tissues in stems, fruits, inflorescence axes, and leaves. This Gloeosporium grows and sporulates readily on numerous artificial media. It grows readily on roots of Manihot and sweet potato, coconut endosperm, and potato tuber, producing on the last named a characteristic dry rot.

Diplodia disease of Hevea brasiliensis, C. D. LA RUE and H. H. BARTLETT (*Mich. Acad. Sci., Arts, and Letters, Papers, 2 (1923), pp. 91–107*).—Cultures of the organism, commonly called *D. cacaoicola*, which causes Hevea die-back have been obtained from practically all parts of the tree. A fungus apparently identical with this is associated causally with a storage rot of Manihot tubers and a rapid and destructive potato tuber wet rot, and is involved in the active parasitism of many other plants. Diplodia is believed to be an important cause of seed deterioration in Hevea. Moldy rot of the tapping area can be produced experimentally with Diplodia spores. In the wood black streaks are produced, which are confused, even by experts, with the black thread disease usually attributed to *Phytophthora faberi*, and it is thought that much of the so-called black thread is due to this Diplodia, which produces little actual damage in healthy trees, since the infections, if not too extensive, eventually heal over and are deeply buried by subsequent growth.

Brown bast census, A. T. REEVE (*Ceylon Dept. Agr. Yearbook, 1925, pp. 13–15*).—The real annual rate of increase of brown bast as computed for the year 1923-24 is placed in the neighborhood of 0.47 per cent for the 1911 clearing and 0.58 per cent for the 1903 clearing. Moreover, the rate of recovery is such that brown bast is probably not to be greatly feared as an immediate evil in those rubber fields that have not been thinned out too drastically.

ECONOMIC ZOOLOGY—ENTOMOLOGY

Observations on the hibernation of ground squirrels, W. T. SHAW (*Jour. Agr. Research* [*U. S.*], *31* (*1925*), *No. 8, pp. 761–769, figs. 6*).—This is a contribution from the Washington Experiment Station, reported in continuation of the investigations previously noted (E. S. R., 54, p. 52). The hibernation records are reported under the headings of intermittent awakening from hibernation, observations on an awakening squirrel, duration of hibernation in the hibernation cabin, duration of hibernation in the large yards, temperature of boxes, body temperature of hibernating squirrels, relation of feeding to aestivation and hibernation, and appearance of a hibernating squirrel.

Live bobwhite quail, T. O. MARVIN ET AL. (*Washington: U. S. Tariff Comn., 1925, pp. V+8*).—This is the report of the U. S. Tariff Commission on the investigation of the costs of production of bobwhite quail in the United States and the principal competing foreign countries.

The commission found the difference in cost of production of live bobwhite quail in the United States and the principal competing country—Mexico—for the season 1925 to be 21.1 cts. per bird. Since the present rate of duty of 50 cts. per bird is 28.9 cts. in excess of this difference, it was concluded that the maximum reduction permissible under the law, 25 cts. per bird, was justified. A proclamation by the President of the United States decreasing the rate of duty accordingly is appended.

Manual of injurious insects, G. W. Herrick (*New York: Henry Holt & Co., 1925, pp. XXI+489, figs. 458*).—The first part of this work with its 25 chapters deals with the losses caused by insects, insect disseminators of plant and animal diseases, useful insects, methods of insect control, insecticides, spraying apparatus, etc. The more important insects are then considered, the arrangement being by crops, animals, or stored products attacked. A list of several of the more important references is appended to the account of each insect. Synoptic tables for the identification of the chief insects attacking various crops, etc., arranged according to the parts attacked, and maps illustrating the distribution of some 100 of the insects treated are included. The work concludes with a chapter on poisonous insects and their relatives and an appendix on the gypsy and brown-tail moths.

On the amount of food eaten by insects, G. N. Wolcott (*Jour. Dept. Agr. Porto Rico, 9 (1925), No. 1, pp. 47–58*).—This is a somewhat extended account with six references to the literature.

Convergent development in leaf-mining insects, S. W. Frost (*Ent. News, 36 (1925), No. 10, pp. 299–305*).—The author traces the development of the leaf-mining habits of the Hymenoptera, Lepidoptera, Coleoptera, and Diptera.

The effect of environmental temperatures upon insect freezing points, N. M. Payne (*Ecology, 7 (1926), No. 1, pp. 99–106, figs. 2*).—The author reports upon freezing point determinations made by the thermoelectric method on oak borers, these insects having been chosen on account of their natural exposure to low temperatures. It was found that the freezing point in the oak borer group lowers in winter and rises in the spring to very near that of water by midsummer. Hardening, or cold resistance, occurs periodically with the seasons out of doors, but can be induced or broken up by exposure to certain temperatures or moistures.

A summary of the answers received to questions on the mechanics of spraying, E. R. de Ong (*Jour. Econ. Ent., 18 (1925), No. 5, pp. 722–726*).—The author presents an analysis, in tabular form, of 82 answers to a questionnaire on spray mechanics.

Notes on oil sprays, A. L. Melander (*Jour. Econ. Ent., 18 (1925), No. 5, pp. 681–686*).—In an investigation at the Washington Experiment Station of the injury resulting from a severe freeze in December, 1924, the author could find no correlation between the extent of winter injury and the use of oil sprays. Caseinate spreaders detracted from the effectiveness of oil sprays when used experimentally on San Jose scale and on eggs of the leaf roller.

Coated arsenate of lead, E. R. Van Leeuwen and P. A. Van der Meulen (*Jour. Econ. Ent., 18 (1925), No. 5, pp. 744–749*).—The authors deal with the coating of lead arsenate with a metallic soap and its use against the Japanese beetle. When lead oleate is precipitated under proper conditions it forms an intimate mixture consisting of globules of lead oleate with uncoated particles of arsenate of lead. After drying, the lead oleate spreads upon the surface of the arsenate of lead powder and upon the leaf and produces a coated material which adheres very firmly to the leaf surface.

Possibilities and limitations of chloropicrin as a fumigant for cereal products, R. N. Chapman and A. H. Johnson (*Jour. Agr. Research [U. S.],*

31 (1925), No. 8, pp. 745–760, figs. 5).—This contribution, from the Minnesota Experiment Station, reports investigations made of the toxicity of chloropicrin to certain insects which infest cereals and its effect on cereals and their products. In a review of the literature, first presented, it is pointed out that the toxicity of this chemical to insects was first noted by Moore in 1917 (E. S. R., 37, p. 848; 39, p. 558). The authors show that the factors of time and temperature bear an inverse ratio to each other when concentration varies from 1 to 125 gm. per cubic meter.

"When concentration is constant, the time required to kill bears a linear relationship to temperature, and this relationship continues down to 0° C. Under practical conditions, it is necessary to increase the volatility by atomizing the chloropicrin in order that a lethal concentration may be built up in the atmosphere before the loss due to leakage so reduces the amount of chloropicrin present that a lethal concentration can never be attained. When the spray of chloropicrin is directed toward the infested areas, the insects are exposed to a saturated atmosphere while the entire volume of the room very quickly attains a lethal concentration. When chloropicrin is present in the flour, deleterious effects are noted in the bread produced from such flour. These effects are due to the ability of the chloropicrin to retard fermentation and to affect in a harmful manner the physical condition of the gluten-forming proteins. When flours or wheats treated with chloropicrin are exposed to the atmosphere for sufficient time, the chloropicrin disappears from them. Fumigated flours given proper exposure to the atmosphere show complete recovery from the chloropicrin treatment."

The list of references includes 22 titles.

Investigations of "tuba," B. A. R. GATER (*Malayan Agr. Jour., 13 (1925), No. 10, pp. 312–329*).—The introduction to this account deals particularly with derris, to which the name tuba is usually applied. Part 1 deals with the insecticidal value of Malayan piscicides made from various plants which go under the collective name of tuba, and part 2 consists of notes on the pests of *Derris* spp. under the headings of leaf feeders and root feeders.

Control of insects in the cauliflower seedbed on Long Island, H. C. HUCKETT (*New York State Sta. Circ. 80 (1925), pp. 11, pls. 4, figs. 2*).—A brief summary of information on control measures for the cabbage maggot, flea beetles, aphids, thrips, diamond-back moth, cabbage looper, and the imported cabbage worm.

Treatise on forest entomology, A. BARBEY (*Traité d'Entomologie Forestière. Paris: Berger-Levrault, 1925, 2. ed., rev. and enl., pp. XVIII+749, pls. 8, figs. 498*).—A second, entirely revised and enlarged edition of the work previously noted (E. S. R., 30, p. 851). The more important forest insects are dealt with under the forest trees attacked (pp. 31–697). This is followed by a brief discussion of useful insects (pp. 699–714), conclusions (pp. 715–721), and a bibliography (pp. 723–728).

[Report of the New York State Station] division of entomology (*New York State Sta. Rpt. 1925, pp. 34–41*).—This is a report on the entomological activities of the year, including the results of spraying and dusting operations with apples, noted on page 539; studies of pear psylla control, bulletins relating to which have been noted (E. S. R., 52, p. 854; 54, pp. 455, 456); the susceptibility of injurious insects to dust mixtures, particularly the rosy aphid, a report upon which has been noted (E. S. R., 53, p. 359), the currant aphid, previously reported upon in Bulletin 517 (E. S. R., 52, p. 455), etc; the control of the cabbage maggot in the seed bed, previously reported upon in Bulletin 512 (E. S. R., 54, p. 355); studies on grape insects, particularly the grape root worm, discussed in Bulletin 519 (E. S. R., 52, p. 558); the efficiency of

dust mixtures in combating the striped cucumber beetle; the control of thrips and aphids on cauliflower, reported upon in the circular noted on page 552; and studies of potato insects, control work with which has been reported upon in Bulletin 518 (E. S. R., 52, p. 533).

[Report of] the entomological branch [Canada] (*Canada Min. Agr. Rpt., 1925, pp. 91–105*).—This is a brief report of the occurrence of, and work of the year with, economic insects in Canada.

Commercial entomology on the west coast of Mexico, A. W. MORRILL (*Jour. Econ. Ent., 18 (1925), No. 5, pp. 707–716*).—In this account the author deals with the insect problems on the west coast of Mexico.

[Entomological work during 1923–24 and 1924–25 in Barbados], C. C. SKEETE (*Barbados Dept. Agr. Rpts., 1923–24, pp. 9, 10; 1924–25, pp. 5, 6, 9, 10*).—Accounts are given of work with the more important insects in Barbados during the years under report. During the year 1923–24 the pink boll worm was found to be established in several of the cotton-growing districts, infestation being severe in the parishes of St. Michael and St. James. The following year it was found in almost all the cotton-growing districts of the island.

Annual report of the entomologist [of Kenya Colony] for the year ending December 31st, 1924, T. J. ANDERSON (*Kenya Colony Dept. Agr. Ann. Rpt. 1924, pp. 96–105*).—Insects of economic importance to coffee and cotton are considered in this report. The entomological record for the year is appended.

Notes from the entomological laboratory, R. W. JACK (*Rhodesia Agr. Jour., 22 (1925), No. 8, pp. 852–855*).—An unusual outbreak of black citrus aphids (*Aphis tavaresi* Del G.) is first reported upon. They appeared in widely separated districts of the Colony with an intensity not previously recorded. This aphid is a pest of the young shoots of citrus only, as described by Symes (E. S. R., 53, p. 53), and the outbreak coincided with the spring growth during the year. In plantations comprising many thousands of trees it was hardly possible to find a young shoot not infested, except where the insects were controlled by means of an insecticide. They are said to be easily killed by tobacco and nicotine washes.

The boll worm seriously attacked oranges in many parts of the Colony, the damage in some groves reaching as high as 50 per cent of the fruit.

List of publications on Indian entomology, 1924, compiled by [T. B. FLETCHER] (*Agr. Research Inst., Pusa, Bul. 161 (1925), pp. 41*).—This list is arranged alphabetically by authors.

A bibliography of the North American Hemiptera-Heteroptera, H. M. PARSHLEY (*Northampton, Mass.: Smith Col., 1925, pp. IX+252*).—In this bibliography the author lists about 2,250 titles, by 600 authors.

A natural breeding area of the beet leafhopper (Eutettix tenella Baker) in the Sierra Nevada Mountains, H. H. P. SEVERIN (*Jour. Econ. Ent., 18 (1925), No. 5, pp. 730–733*).—This is a contribution from the California Experiment Station in which the author reports having found the beet leafhopper in four valleys situated in the Sierra Nevada Mountains, a natural breeding ground occurring in Honey Lake Valley at an altitude of about 4,000 ft. There is no evidence to show that the adults migrate from the mountain valleys into the Sacramento Valley.

Percentage of curly leaf infection in beet leafhopper (Eutettix tenella Baker) and winter host plants under field conditions, H. H. P. SEVERIN (*Jour. Econ. Ent., 18 (1925), No. 5, pp. 733–737*).—This is a contribution from the California Experiment Station, in which the author reports that 17 per

cent of the spring brood adults collected on the foothills of Little Panoche Valley in the San Joaquin Valley have transmitted curly leaf to sugar beets. One per cent of red stem filaree (*Erodium cicutarium*), the winter host plant, harbored curly leaf under natural conditions on the foothills of Little Panoche Valley.

Aphids new to Ohio, C. R. Cutright (*Ohio Jour. Sci., 25 (1925), No. 6, pp. 313, 314*).—This list of 18 species supplements Guyton's list of Ohio Aphididae (E. S. R., 51, p. 56), and includes bibliographical references to the latest and most complete literature dealing with each species.

Vegetable plant lice, T. J. Headlee (*New Jersey Stas. Circ. 178 (1925), pp. 30, figs. 20*).—This is a revision of and supersedes Circular 107, previously noted (E. S. R., 41, p. 255).

Controlling Florida's citrus aphid through proper grove management, J. R. Watson (*Fla. Grower, 33 (1926), No. 3, pp. 8, 21, figs. 2*).—This is a contribution from the Florida Experiment Station, in which a practical program is outlined from which results can be obtained with the least expense.

A slow process method of cyanide fumigation for the control of whitefly in tomato houses, E. R. Speyer and O. Owen (*Nature [London], 116 (1925), No. 2922, p. 644*).—The authors report that experiments have shown that it is possible to generate hydrocyanic acid gas from a mixture consisting of 3 parts by weight of powdered sodium bicarbonate and 1 part by weight of high-grade sodium cyanide (98 per cent purity) for the purpose of fumigating tomato houses in the control of the greenhouse whitefly. The mixture is scattered on the dry paths of the houses at the rate of 1 oz. to every 1,000 cu. ft. of space. The results show that the mortality for the adult fly is as great as that obtained where the gas is generated quickly from sodium cyanide and sulfuric acid in jars, but the percentage of mortality for the scale stages is slightly higher in the latter method. Economically the slow generation obtains practically as good a control as the quick method, and it has great advantages in the saving of labor and in minimizing the risk of scorching plants which are grown soft.

The value of sprays for black scale control in California, R. S. Woglum and J. R. LaFollette (*Jour. Econ. Ent., 18 (1925), No. 5, pp. 726–729*).—Three sprays are said to have shown results superior to fumigation in black scale control. These sprays also control the citrus red spider, against which fumigation is ineffective.

The use of kerosene emulsion in control of the scale Toumeyella sp. on loblolly pine, E. W. Hadley (*Jour. Econ. Ent., 18 (1925), No. 5, pp. 749–751*).—The author concludes that a solution of 1 part of kerosene emulsion to 5 parts of water will give the best results as a spray for the control of the Toumeyella scale on loblolly pine.

The diaspine Coccidae of Japan, I, II, I. Kuwana (*Japan Dept. Finance, Imp. Plant Quar. Serv., Rev. Bur., Tech. Buls. 1 (1925), pp. [2]+18, pls. 3; 2 (1925), pp. [2]+42, pls. 11*).—The first of these papers has been noted from another source (E. S. R., 54, p. 55). The second paper consists of descriptions of 18 species of the genus Lepidosaphes from Japan proper, including 7 new to science. A list of 4 species and 1 variety recorded from Japan, but not thus far collected, is appended.

Some weather relations of the pale western cutworm (Porosagrotis orthogonia Morr.).—A preliminary study, W. C. Cook (*Ecology, 7 (1926), No. 1, pp. 37–47, figs. 6*).—This is a contribution from the Montana Experiment Station. The author finds, from a study of the weather conditions preceding outbreaks of *P. orthogonia* in Montana, Colorado, and New Mexico, that the total rainfall in May, June, and July of the year preceding a cutworm outbreak is a factor of great importance.

"The critical amount of rainfall varies with the temperature and produces a definite, critical soil moisture. If the moisture exceeds the critical amount, the number of cutworms decreases in the following year; if the moisture be less than the critical amount, the number of cutworms increases. The effect is cumulative, and severe outbreaks follow a series of dry years. The physiological factors responsible for this relation have not been definitely determined. It seems probable that fungus and bacterial diseases are of the greatest importance, that insect parasites are of secondary importance, and that there may be a direct physiological effect of moisture upon the larva and pupa."

An outbreak of Agrotis ypsilon Rott. on overflow land in western Oregon, L. P. ROCKWOOD (*Jour. Econ. Ent., 18 (1925), No. 5, pp. 717–721*).—An outbreak of the black cutworm which destroyed a seeding of 200 acres of spring oats is recorded for western Oregon. Notes are presented on the successful control of this outbreak by the standard bait method and on the habits, natural enemies, and life history, together with a description of the larva.

The European corn borer, R. H. PETTIT (*Michigan Sta. Quart. Bul., 8 (1925), No. 2, pp. 59–61, fig. 1*).—This consists of excerpts from the circular previously noted (E. S. R., 54, p. 458).

Cankerworms, R. E. SNODGRASS (*Smithsn. Inst. Ann. Rpt., 1924, pp. 317–334, figs. 19*).—This is a semipopular account of canker worms.

Laboratory experiments with arsenicals in the control of the codling moth, E. J. NEWCOMER (*Jour. Econ. Ent., 18 (1925), No. 5, pp. 679, 680*).—This is a brief summary of work conducted by the U. S. D. A. Bureau of Entomology in Washington State.

Possibilities of an ovicide as an auxiliary in codling moth control, L. CHILDS (*Jour. Econ. Ent., 18 (1925), No. 5, pp. 665–674*).—This is a discussion presented with a view to stimulating further observation of the value of an ovicide as an auxiliary to arsenate of lead in codling moth control.

Behavior of Phytophaga destructor Say under conditions imposed by emergence cages, W. H. LARRIMER (*Jour. Agr. Research [U. S.], 31 (1925), No. 6, pp. 567–574, figs. 2*).—This contribution deals with the design of a number of emergence cages, and the determination of the relative efficiency both as to approach to natural conditions and ability to recover emerged flies. Of a total of 38,500 flaxseeds used in these experiments, records were made on 17,500, from which one may expect 13,125 flies to have emerged, and of these 6,278 were recovered by the various cages. An additional 385 were recovered by the cages in the first trial, making a total of 6,663 flies recovered and counted during the experiment. It is concluded that the practical application of the emergence cage to Hessian fly investigations is confined principally to life history and control studies of other than a predictive nature.

The wheat-stem maggot, G. I. GILBERTSON (*South Dakota Sta. Bul. 217 (1925), pp. 28, figs. 8*).—This is a summary of information on *Meromyza americana* Fitch, based upon a review of the literature and life history studies conducted in South Dakota. It has been found to be widely distributed over the State, occurring wherever it can find certain native grasses or cultivated cereals in which to breed. The adult flies appear about the first of June, and each female lays an average of from 25 to 30 eggs, which are usually deposited singly on different plants. The eggs hatch in 4 or 5 days, and the maggots, after feeding, pupate in from 18 to 22 days, the pupal stage lasting from 12 to 16 days. There may be 3 generations a year, although in some cases only 2 are produced annually.

Records show the pest to be rather heavily parasitized in South Dakota, from 30 to 65 per cent of its numbers being destroyed annually by *Microbracon meromyzae* Gah. and *Coelinidea meromyzae* Forb., but these parasites can not

be relied upon to reduce the numbers of the pest to a point where it is a negligible factor in cereal production. Such measures as rotation of crops, trap crops, destruction of volunteer grains and grasses, and the late planting of fall grain are said to aid greatly in the suppression of the pest. Poisoned baits, though to a degree effective, are not recommended because of the labor and expense.

Papers on Indian Tabanidae.—VIII, The bionomics and life-histories of some of the common Tabanidae of Pusa, P. V. ISAAC (*India Dept. Agr. Mem., Ent. Ser., 9 (1925), No. 2, pp. 21–28, pls. 6*).—This account deals with five species of the genus Tabanus and with *Gastroxides ater* Saund.

Winter trapping of the fruit-fly, Ceratitis capitata (Weid.), L. J. NEWMAN ([*West. Aust. Dept. Agr.*] *Leaflet 137 (1924), pp. 5, figs. 7*).—This has been noted from another source (E. S. R., 52, p. 757).

The stickfast flea, J. G. C. CAMPBELL (*West. Aust. Dept. Agr. Bul. 104 (1923), pp. 16, figs. 9*).—This account of the life history and bionomics of *Echidnophaga gallinaceus* is based upon work conducted at the University of Western Australia. This flea is a serious pest of poultry in certain parts of that State.

Fluctuation in the distribution of the Colorado potato beetle, C. H. BATCHELDER (*Jour. Agr. Research* [*U. S.*], *31 (1925), No. 6, pp. 541–547, fig. 1*).—The fluctuation in the abundance and distribution of this beetle in a potato-growing region led to the observations here reported. It is pointed out that this beetle becomes so inconspicuous during occasional years that some growers do not feel justified in using a poison with their early sprays, and that in any year the distribution of the species in a given locality is extremely uneven. Great variation is found in the percentage of infestation from field to field, from farm to farm, and from one locality to another in the same year as well as over a period of years. No satisfactory explanation of the phenomena is said to have been offered except that of parasitism. The author's investigations, which are reported under the heading of field studies, include the protection of early covering, influence of the previous crop, earliness, and the volunteer. His study of infested potato fields in western New York and northern Maine is said to indicate that the variation in distribution described is due to several factors, including the height of the cultivation ridge, the nature of the previous crop, the earliness in the appearance of the shoot above ground, the deterrent effect of the early sprays, and fluctuations in the numbers of volunteer potato plants.

Physiological studies on hibernation in the potato beetle, Leptinotarsa decemlineata Say, D. E. FINK (*Biol. Bul. Mar. Biol. Lab., Woods Hole, 49 (1925), No. 5, pp. 381–406, figs. 13*).—Food experiments conducted by the author indicate that potato beetles of the first generation when fed on tubers and fruit of the potato, tomato, and eggplant require 13 days' feeding to enter hibernation, while those fed on foliage of the same plants need 16 days.

"Beetles fed on potato foliage for 6 days followed by a nonsolanaceous food required 23.6 days' feeding before hibernation, and produced a mortality of 55 per cent. Those fed on pepper plants or on nonsolanaceous foods do not hibernate, but die of starvation. Preparation for hibernation follows a period of extensive feeding and consists in an accumulation in the adipose tissues of 29 per cent fat. During prehibernation a reduction of the water content of 20 per cent, the elimination of waste products from the digestive tract, and a lowered metabolic activity of the animal take place." A bibliography of 29 titles is included.

The strawberry rootworm, a new pest on greenhouse roses, C. A. WEIGEL (*U. S. Dept. Agr. Bul. 1357 (1926), pp. 48, figs. 16*).—This is a report of studies

of *Paria canella* varieties *quadrinotata* (Say) and *gilvipes* (Crotch) commenced in July, 1919, when the first records were received of its injury to greenhouse roses. It is pointed out that this native insect has been known during the last 40 years as a serious enemy of strawberry, raspberry, and a few other plants only. Suddenly it appeared in greenhouses, attacking roses in Virginia, Indiana, New Jersey, Pennsylvania, and Maryland, and has become one of the serious enemies of roses grown under glass, through the feeding of the larvae on the roots and of the adults on the foliage, stems, buds, and flowers. Preliminary accounts of this pest on roses and control measures have been noted (E. S. R., 47, p. 855; 49, p. 658). Investigations of its life history, habits, and control measures are here reported at length, considerable data being presented in tabular form.

Its natural enemies appear to be few in the greenhouse, no parasites having been observed attacking any of the stages. Spraying with arsenicals did not prove practical under ordinary conditions, but was found to be successful in protecting the swelling and breaking buds at the time the plants were cut back. Under similar conditions a Bordeaux-arsenate of lead mixture served as a repellent. In extensive trials, the use of a 10 or 15 per cent dry mixture of arsenate of lead or calcium arsenate and superfine sulfur showed that dusting with these materials was a satisfactory and effective method of keeping the foliage coated with an arsenical to repel the beetles. Experiments with Paris green gave unsatisfactory results. In 21 commercial houses fumigation with hydrocyanic acid gas during the resting period of the plants consistently produced an average mortality of at least 95 per cent of all beetles above ground. Fumigation with vaporized nicotine did not kill the adults. The effectiveness of hand-picking the beetles, as practiced by many florists, may be counteracted by the overlapping of generations of the insect. Treatment of the soil with 10 different insecticides either failed to kill the larvae and pupae or were detrimental to the plants. Contact with tobacco dust, which was placed on the soil surface, killed newly hatched larvae, and the leaching of tobacco dust and wood ashes also killed some larvae and pupae in the soil.

The gooseberry rootborer (Xylocrius agassizii Lec.), W. J. Chamberlin (*Jour. Econ. Ent., 18 (1925), No. 5, pp. 674–679*).—The author reviews the literature and reports investigations at the Oregon Experiment Station, giving data on its life history. He finds that no satisfactory control measure is known.

Observations on Syneta albida Le Conte in Oregon and experiments for its control, J. Wilcox (*Jour. Econ. Ent., 18 (1925), No. 5, pp. 686–689, pl. 1*).—This is a contribution from the Oregon Experiment Station on the Syneta leaf beetle, which appeared at Corvallis in the spring and fed on the developing buds and blossoms of the apple and the leaves and developing fruit of the cherry. No satisfactory control was obtained for apples, but one application before blossoming of lead arsenate (5–100) plus 5 lbs. of hydrated lime gave nearly perfect control on cherries.

Some effects of Tribolium on flour, N. M. Payne (*Jour. Econ. Ent., 18 (1925), No. 5, pp. 737–744, figs. 3*).—The author finds that flour beetle infestation affects the elasticity and the viscosity of flour. Heavy infestation turns flour a pinkish tinge which becomes brown upon oxidation. Adults give off a characteristic secretion soluble in water. This secretion may be the cause of the marked effect which flour beetles have on the physical properties of flour colloids.

Baiting wireworms, A. Spuler (*Jour. Econ. Ent., 18 (1925), No. 5, pp. 703–707*).—In work at the Washington Experiment Station calcium cyanide

was found to be an effective soil fumigant for the wet land wireworm, *Pheletes occidentalis*, but it is too expensive. Baits concentrate wireworms and when used in soil fumigation decrease the cost of treatment. Germinating seeds attract more worms and are more easily planted than other forms of baits.

The coffee borer (*Planters' Chron., 20 (1925), No. 47, pp. 857–860*).—A brief discussion of *Xylotrechus quadrupes*.

The coffee borer, K. Kunhi Kannan (*Planters' Chron., 20 (1925), No. 51, pp. 922–924*).—A brief summary of investigations of *Xylotrechus quadrupes* conducted in the entomological section of the Department of Agriculture, Mysore, India.

The rôle of the bean straw stack in the spread of bean weevils, A. O. Larson and C. K. Fisher (*Jour. Econ. Ent., 18 (1925), No. 5, pp. 696–703, figs. 2*).—The authors point out that beans remaining in straw stacks in California furnish a breeding place for many generations of the bean weevil and are a potential source of infestation for growing crops as long as the stacks remain.

The leaf-mining habit in the Hymenoptera, S. W. Frost (*Ann. Ent. Soc. Amer., 18 (1925), No. 3, pp. 399–414, pls. 2*).—The author deals with the origin of the leaf-mining habit and the abundance of distribution and discusses the life histories of leaf-mining Hymenoptera. A list of the leaf-mining Hymenoptera and their food plants, an index to species of leaf-mining Hymenoptera, and a bibliography are included.

Bees show resistance to American foulbrood, G. H. Cale (*Amer. Bee Jour., 65 (1925), No. 12, pp. 563, 564*).—The author recites instances of immunity of bees to this disease.

Notes on the larvae of the Chalcidoidea, H. L. Parker and W. R. Thompson (*Ann. Ent. Soc. Amer., 18 (1925), No. 3, pp. 384–398, figs. 19*).—In this paper the authors deal with the larval types in the Chalcidoidea (pp. 384-387), describe two new forms of caudate chalcid larvae (pp. 388-392), and discuss the primary larva of *Stilbula cynipiformis* Ros. (Eucharidae) (pp. 392-394).

The parasites of Pseudococcus maritimus (Ehrhorn) in California (Hymenoptera, Chalcidoidea) (*Calif. Univ. Pubs., Ent., 3 (1924), No. 2, pp. 223–288, pls. 2, figs. 8*).—This bulletin consists of two parts:

I. *Taxonomic studies*, P. H. Timberlake (pp. 223-251).—Descriptions are given of primary and secondary parasites of the grape mealybug, of which two are described as new to science.

II. *Biological studies and life histories*, C. P. Clausen (pp. 253–288).—The author first describes the three forms of this mealybug occurring in California. The first form, which occurs in southern California, is an omnivorous feeder, occasionally of importance as a citrus pest, and has three parasites, none of which is of any consequence in control. The second form, which occurs in the San Francisco Bay region, is also an omnivorous feeder, at times a serious pest in pear orchards, and has no parasites whatsoever. The third form, which occurs in the San Joaquin Valley, is a pest of the grape, being largely restricted to it as a host, and has a series of five parasites, which frequently effect a parasitism in excess of 90 per cent. The three forms are morphologically identical, though the form from the San Joaquin Valley may be termed a physiological race, with special adaptation to its particular host.

Of the eight primary parasites thus far reared from this mealybug in California, *Zarhopalus corvinus* (Gir.) is by far the most important. While in numbers it is exceeded by *Acerophagus notativentris* (Gir.), a solitary parasite which ranks first numerically, its effectiveness, when measured by the aggregate number of hosts destroyed, is much greater. *Anagyrus subalbi-*

cornis (Gir.) ranks third in point of numbers, constituting 21.6 per cent of all individuals reared from field material in the San Joaquin Valley, but second in effectiveness. It is, however, restricted to *P. maritimus* on grape in the San Joaquin Valley. *A. notativentris* ranks third in the percentage of mortality effected. Other primary parasites studied include *Pseudleptomastix squammulata* (Gir.), *Chrysoplatycerus splendens* (How.), and *Pseudaphycus angelicus* (How.). Hyperparasites include *Thysanus elongatus* (Gir.), *Achrysopophagus modestus* Timb., *Tetrastichus blepyri* Ashm., and *Subprionomitus* sp.

The blackberry mite, the cause of redberry disease of the Himalaya blackberry, and its control, E. O. Essig (*California Sta. Bul. 399 (1925), pp. 3-10, pl. 1, figs. 5*).—This is a report of observations of a species of Eriophyes, first called to the author's attention during the late summer of 1921 as a source of injury to the Himalaya blackberry along the California coast. Its injury, known as redberry disease, is characterized by the red condition of the fruit at harvest time. The mites enter the flowers and infest the berries as the drupelets are forming, and remain at the base of the berry and about the core. They feed near the bases of the drupelets, causing abortion in many cases, a retarded and uneven ripening in some, and an abnormal red condition in the great majority of cases. A few berries often remain entirely green or entirely red, while some are to be found with green, red, and fully ripened drupelets.

The species has been determined by H. E. Ewing as *E. gracilis* (Nal.), common on the European raspberry (*Rubus idaeus* L.), and causing, according to A. Nalepa, a yellow erineum on the tender leaves (E. S. R., 25, p. 858). In California the species appears to be limited to the Himalaya blackberry, and both appear to thrive best in a cool, moist climate, being most abundant in the San Francisco Bay region and the Santa Cruz foothills.

Extensive experiments and field demonstrations have proved that the mite can be effectively controlled by the application of early spring sprays, and that infestations and injuries may be completely checked by the use of summer sprays. The most satisfactory results are said to be obtained by the application of dormant or early spring sprays to kill the hibernating forms before they gain entrance into the flowers and berries. The use of commercial lime sulfur in strengths of 4, 6, or 8 per cent, or corresponding strengths of dry lime sulfur or of soluble sulfur, is recommended. The improved, highly refined lubricating oil emulsions are also said to be satisfactory. Demonstrations, conducted by P. S. Williamson in Santa Cruz County, showed that later spring sprays of either 4 per cent lime sulfur or of wettable sulfur, applied when the vines are in full bloom, are nearly as effective as the dormant sprays.

ANIMAL PRODUCTION

Range watering places in the Southwest, M. W. Talbot (*U. S. Dept. Agr. Bul. 1358 (1926), pp. 44, pls. 18, figs. 4*).—This publication deals largely with the necessity of supplying watering places on the range at distances not further than 4 to 5 miles apart for cattle in flat country or 3 miles in rolling country and 1 to 2 miles in rough country. In the case of sheep and goats under favorable conditions the distances may be doubled. The unfortunate experiences due to overgrazing, etc., accompanying a lack of sufficient sources of water are pointed out, and directions are given for the digging of wells and the construction of reservoirs and tanks.

Method of determining digestibility [trans. title], E. A. Bogdanov (*Nauch. Agron. Zhur. (Jour. Landw. Wiss.), 1 (1924), No. 5-6, pp. 350-376*).—The author cites the results of six series of experiments in which the digestibility of

rations of timothy and clover hay and mixtures of the hay with concentrates were determined with wethers. The digestibility of the feeds as determined at the same time and in the same ration but with different animals was usually quite uniform, though in succeeding periods even with the same ration or with different combinations of feeds the digestibility was found to be quite different from that calculated in the first experimental period.

It is assumed that the composition of the feed may change during storage even though a sample of the same material is used, and it is also suggested that changes in the bacterial flora of the rumen may occur as a feed is continued. Such changes may influence the digestibility. It is suggested that basal rations for digestibility experiments should contain a variety of substances, and that control animals receiving the basal ration only be fed during the experimental period.

The present position of the conservation of green feed based on a survey by the Minister of Nutrition and Agriculture [trans. title], LIEHR (*Ber. Landw. Reichsmin. Ernähr. u. Landw.* [*Germany*], *n. ser., Spec. No.* (*1924*), *pp. 48*).—The results of a survey of the numbers and capacity of the different types of silos in Germany in June, 1923, are reported, with a discussion of these results by Gerlach.

Silage: Its composition and value as a farm food, G. N. BLACKSHAW (*Rhodesia Agr. Jour., 22* (*1925*), *No. 2, pp. 191–201*).—After reviewing the effect of various factors on the quality of silage, sugar analyses, and the ratio of crude protein to sugar in corn, sunflowers, velvet beans, dolichos beans, kudzu vines, Niger oil, and Napier grass are tabulated. The composition is also tabulated and discussed for samples of silage made in 4-gal. tins at the Salisbury Experiment Station from the following crops: Velvet beans in the flowering stage, velvet beans with pods well developed, dolichos beans (pods well developed), cowpeas (pods well developed), kudzu vines, beggar weed, dahl (flowering stage), corn (milk stage), Uba cane, Indian cane, Napier grass, guinea grass, Sudan grass (second growth), Kokoma grass, sunflowers with head unopened, sunflowers partially in blossom, sunflowers (top half of plants in the advanced flowering stage), Niger oil, sweet potato tops, and sunflower and corn silage mixed in equal parts. Rations including silage are suggested for beef and dairy cattle.

New standards for hay [trans. title], E. A. BOGDANOV (*Nauch. Agron. Zhur.* (*Jour. Landw. Wiss.*), *1* (*1924*), *No. 2, pp. 115–129*).—A study of the value of Russian hays indicated considerable differences in the values for different purposes and for hay made at different stages of maturity and grown under different conditions. Hays having the highest values were rated as meadow hay, river bottom hay, and clover hay 100, wild hay 75, and reed grass hay 50.

Commercial feeding stuffs, J. L. HILLS, C. H. JONES, and G. F. ANDERSON (*Vermont Sta. Bul. 247* (*1925*), *pp. 3–45*).—The results of the official analyses of feeding stuffs collected during March and April, 1925, are given (E. S. R., 53, p. 667), including a discussion of the general qualities of feeds.

The water-soluble vitamin content of the velvet bean, W. D. SALMON and E. R. MILLER (*Jour. Agr. Research* [*U. S.*], *31* (*1925*), *No. 8, pp. 793–799, figs. 10*).—Investigations of the vitamin B content of velvet beans were conducted with pigeons and rats at the Alabama Experiment Station.

In the experiments with pigeons, from 1 to 2 gm. of ground velvet beans were found to restore pigeons suffering with polyneuritis to the normal condition. Alcoholic and acetic acid extracts were likewise effective, but beans which had been thoroughly extracted were noneffective. In the ex-

periments with rats, the best growth was made with rations containing 20 per cent of velvet beans, 10 per cent being too little and 50 per cent producing the toxic effect. Adding yeast to either the 20 or 50 per cent diet increased the rate of growth. Cooking or autoclaving the beans tended to lessen the toxicity but did not entirely overcome it.

Minerals and vitamins in stock feeding, J. B. ORR (*Farmer and Stock-Breeder and Agr. Gaz., n. ser., 39 (1925), No. 1874, p. 1981*).—A popular account of the relation of the findings of mineral and vitamin experiments to practical livestock feeding.

Dietary requirements for reproduction.—III. The existence of the reproductive dietary complex (vitamin E) in the ethereal extracts of yellow corn, wheat embryo, and hemp-seed, B. SURE (*Jour. Biol. Chem., 62 (1924), No. 2, pp. 371–396, figs. 13*).—In continuing this series of studies at the Arkansas Experiment Station (E. S. R., 51, p. 563), it was found that diets consisting mainly of casein or skim milk powder and dextrin, with minerals, yeast-vitamin-powder, cod-liver oil, and agar, produced normal growth, but the individuals raised on such diets were infertile unless some source of vitamin E was supplied. Ethereal extracts of wheat embryo, yellow corn, and hemp seed added as 3 to 5 per cent of the ration were found to furnish this substance in sufficient amounts. Additions of 5 per cent of cottonseed oil or olive oil likewise allowed normal fertility, but coconut oil, linseed oil, and sesame oil were not effective. Normal litters were born, but the young were dead when purified rations were supplemented with 20 per cent of wheat germ which had been previously extracted with ether. Two females were able to produce living young with supplements of 35 per cent of the ether extracted wheat germ in the ration.

Females reared on the purified diets and producing young were in certain cases found unable to rear their young. Doubling the amount of vitamin B in the rations allowed the young to survive for a longer period, and trebling the amount required for normal growth allowed the female to produce sufficient milk to raise her young to weaning. There thus appears to be an increased vitamin B requirement for lactation. The author concludes that a ration of 50 per cent of skim milk powder, 0.2 per cent of ferric citrate, 2 per cent of cod-liver oil, and 2 per cent of agar agar supplies sufficient amino acids, minerals, antixerophthalmic and antirachitic vitamins and roughage, but requires supplementing with vitamin E for reproduction and with more vitamin B than is required for normal growth to induce successful lactation.

The anti-sterility vitamine fat soluble E, H. M. EVANS and G. O. BURR (*Natl. Acad. Sci. Proc., 11 (1925), No. 6, pp. 334–341*).—In further experiments with this vitamin (see p. 527) its content in various foods has been estimated, using female rats for making the determinations. These results have indicated that it is present, though never in highly concentrated amounts, in many of the animal tissues, but that its content is lower in the viscera than in the muscle and fat. Butterfat contains a small amount, but the content in milk seems to be influenced by the feeding of the cows, since milk from cows receiving fresh alfalfa pasture contains larger amounts. Vitamin E is present in large amounts in the seeds and green leaves of certain plants. Wheat embryo is particularly rich in this substance. Vitamin E is fat-soluble and is contained in many of the vegetable oils.

In experiments to determine the requirements and storage of the anti-sterility vitamin in animal tissues under different conditions, it was found that fertility was reestablished in sterile females by feeding tissues from

other females receiving a supply of the vitamin in their diet, but not by feeding tissues from females which had become sterile through a lack of this vitamin. The tissues of normal newborn young were found to contain an adequate supply of E. Fertile females shifted to a diet lacking in the anti-sterility vitamin were found to maintain the ability to produce young for from 3 to 4 months after the change, but sterility then followed irrespective of whether the female had produced young or not during this period, indicating that there is a normal usage or wastage of the vitamin in the usual metabolic processes of the body. Excess of the E factor did not stimulate beyond normal the numbers or birth weights of the young born. The administration of a single large dose of E equivalent to the total of the minimum daily doses necessary for normal fertility allowed normal pregnancy to occur.

In discussing the physical and chemical properties of the vitamin, it is pointed out that vitamin E is fat-soluble, but also has a wider range of solubility than fats. It is apparently insoluble in water. Heat, light, air, acids, and alkalies have little or no effect on it unless the material is ashed, in which case the vitamin is destroyed. An outline of the fractionation of E as has been carried out in the authors' experiments from the wheat embryo is given.

Research in the physiology of reproduction, F. H. A. MARSHALL (*Farmer and Stock-Breeder and Agr. Gaz., n. ser., 39 (1925), No. 1875, p. 2031*).—A popular review of the physiological factors related to reproduction in domestic animals.

The nutrients required to develop the fetus [trans. title], I. S. POPOV (*Nauch. Agron. Zhur. (Jour. Landw. Wiss.), 1 (1924), No. 3, pp. 205–210*).—Analyses indicate that fetuses are composed of from 78 to 82 per cent of water, and that the dry matter consists of from 12 to 15 per cent protein, 4.2 per cent ash, and 0.2 per cent fat. Assuming that the digestible nutrients of the food are similarly utilized for fetal development and the production of milk, it is calculated that the cow requires during the last third of the gestation period for the development of the fetus from 130 to 140 gm. of starch value and 85 gm. of digestible protein, while the pregnant sow during the second half of gestation requires 90 gm. of starch value and 50 gm. of digestible protein. The bovine fetus also requires for growth not less than 20 gm. of calcium oxide and the sow not less than 6 gm. of calcium oxide daily. The amount of nutrients thus calculated for the development of the fetus is comparatively small.

The sexual glands and metabolism.—II, Influence of emulsions of testis and prostate upon the nitrogen metabolism of rabbits, V. KORENCHEVSKY and M. CARR (*Brit. Jour. Expt. Path., 6 (1925), No. 2, pp. 74–83*).—In 16 experiments with 4 entire and 2 castrated male rabbits, the effect on nitrogen metabolism of subcutaneous injections of emulsions of kidney, testis, and the prostate gland separate and in mixtures was investigated at the Lister Institute in continuing this series of studies (E. S. R., 53, p. 665).

The results of the experiments showed that both testis and kidney emulsions slightly lowered the nitrogen balances during the periods of injections and in many cases during the following 6 to 9 days. Similar injections of emulsions of the prostate alone or in combination with the testis emulsions increased the nitrogen balances up to 11 per cent, particularly during the 2 to 3 days following the injections. Castrated and entire animals reacted similarly. The authors conclude that an internal secretion is produced by the prostate which influences nitrogen metabolism.

Effects of castration on immature guinea pigs, M. D. SUMULONG (*Philippine Jour. Sci., 27 (1925), No. 3, pp. 325–349, figs. 4*).—The comparative rates of

growth in weight and measurements of height, body length, etc., are recorded for 35 guinea pigs castrated at six weeks of age and for their 29 noncastrated litter mates. The comparative weights of the various organs and lengths of the various bones are also tabulated.

The results showed that castration tended to produce a temperament similar to the female. All secondary sex characters seemed to remain infantile in type except the penis, which was practically normal. The operation resulted in moderately increasing the growth in body weight, body length, height, and body circumference. The increase in body length and height was evidenced prior to sexual maturity, but the increase in body weight and circumference occurred after sexual maturity. The general body conformation showed practically no change. The long bones and the vertebral column were somewhat longer after castration.

Investigation of a statistical means of calculating the form of the skull of some domestic mammals of draft size [trans. title], U. DUERST (*Ztschr. Tierzüchtung u. Züchtungsbiol., 3 (1925), No. 3, pp. 297–341, figs. 22*).—The author has calculated mathematical formulas for expressing the shape and form of the skulls of horned and polled cattle, with a study of their application to the skulls of horses.

History and handbook of Hereford cattle and Hereford bull index, J. M. HAZELTON (*Kansas City, Mo.: Hereford Jour. Co., 1925, pp. VII+391, pl. 1, figs. 12*).—A history of the origin and development of Hereford cattle, including their introduction into the United States and success and popularity in the different portions of the country. A Hereford bull index, accounts of the winners at various livestock shows, and other interesting information are also included.

Cooperative project and outline of plan for a study of the factors which influence the quality and palatability of meat (*[U. S. Dept. Agr., Bur. Anim. Indus., 1925], pp. 48*).—A mimeographed outline of the plans for studying the factors influencing the quality and palatability of meat in a cooperative project of the various State experiment stations and the U. S. Department of Agriculture.

Fattening yearling steers on dry-farms, R. H. WILLIAMS, E. B. STANLEY, and C. A. SMITH (*Arizona Sta. Bul. 110 (1925), pp. 61–82, figs. 10*).—The results of two experiments in feeding yearling steers are reported.

In the first experiment 4 lots of steers averaging approximately 530 lbs. in weight were employed for comparing various silages when fed with alfalfa hay and cottonseed meal in a 112-day test. Lot 1 received Papago sweet corn silage for 88.5 days and Red Amber sorghum silage for 23.5 days. Lots 2 and 3 received Red Amber sorghum silage, and lot 4 received Red Amber sorghum silage for 30.5 days, Papago sweet corn silage for 43 days, and mixed silage for 38.5 days. The horns were sawed off of the steers in lot 3 soon after the experiment commenced. The average rations, gains, and feed consumption per 100 lbs. of gain are given in 4-week periods.

During the entire 112 days the average daily gains of lots 1, 2, 3, and 4 were, respectively, 1.81, 1.72, 1.74, and 1.65 lbs. The hay consumption of these lots per 100 lbs. of gain was, respectively, 166, 173, 172, and 181 lbs. The steers in these lots also consumed the following amounts of cottonseed meal per 100 lbs. of gain, 153, 160, 159, and 168 lbs. The silage consumption was 1,948, 2,013, 1,997, and 2,129 lbs. per 100 lbs. of gain. The relative values of the cattle per 100 lbs. in the different lots at the end of the test were $7.10, $6.95, $7.05, and $6.90. Based on the larger gains made on the sweet corn silage than on the sorghum silage, it was calculated that sweet corn silage was worth from 25 to 30 cts. per ton more than sorghum silage, but the

sorghum silage kept better than the corn silage. The dehorned steers were found to be more gentle in the feed lot than the horned animals, and the gains were slightly better notwithstanding the fact that the dehorned steers made smaller gains during the first 8 weeks. The changes in the kind of silage fed to lot 4, which were made 5 times, reduced the gains of this lot from 5 to 10 per cent.

The comparative value of sweet sorghum silage, sunflower silage, and sweet sorghum fodder was studied in the second experiment when fed with cottonseed meal with and without mixed hay. Four lots of 10 rather inferior yearling steers each averaging 416 to 445 lbs. per head in the different lots were used for this test. The rations fed were as follows: Lot 1 sweet sorghum silage for the first 30 days only, sunflower silage, mixed hay, and cottonseed meal; lot 2 sweet sorghum silage and cottonseed meal; lot 3 sweet sorghum silage, mixed hay, and cottonseed meal; and lot 4 sweet sorghum fodder, sweet sorghum silage, mixed hay, and cottonseed meal.

During the 100 days of the experiment the average daily gains of lots 1, 2, 3, and 4 were, respectively, 1.84, 2.12, 2.14, and 1.88 lbs. Lot 1 required 78 lbs. of cottonseed meal, 170 lbs. of mixed hay, and 1,715 lbs. of sunflower silage per 100 lbs. of gain. In making an equal gain lot 2 consumed 67 lbs. of cottonseed meal and 1,922 lbs. of sorghum silage. The feed required per 100 lbs. of gain by lot 3 was 66 lbs. of cottonseed meal, 118 lbs. of mixed hay, and 1,646 lbs. of sorghum silage. Lot 4 required 76 lbs. of cottonseed meal, 140 lbs. of mixed hay, 716 lbs. of sorghum fodder, and 479 lbs. of sorghum silage to produce 100 lbs of gain. The results showed no advantage for adding the mixed hay to the ration of sorghum silage and cottonseed meal. Sunflower silage was not as palatable as the sweet sorghum silage, but the results obtained with it were not unfavorable. Sweet sorghum silage gave better results than sweet sorghum fodder, but the latter proved to be a fairly satisfactory feed.

Grading for beef, P. J. v. d. H. Schreuder (*Union So. Africa Dept. Agr. Jour., 10 (1925), No. 5, pp. 446–454, figs. 8*).—A preliminary report is given of experiments conducted at the Potchefstroom School of Agriculture dealing with the advantages of grading up Africander cattle with Sussex and Hereford bulls. Such crosses have given good results in the first and second generations. Two lots of steers marketed have graded high and have produced good quality carcasses with comparatively high dressing percentages. An advantage for supplemental winter feeding of silage and bone meal was also pointed out in one experiment.

Methods of management of calves [trans. title], A. S. Solun (*Nauch. Agron. Zhur. (Jour. Landw. Wiss.), 1 (1924), No. 4, pp. 312–327, figs. 5*).—The results of investigations are reported which show that differences in the amounts and kinds of feeds given to calves tended to be reflected in the growth and development of the animals, which were evident even after the animals were placed on normal rations.

Investigation of the cuticular pili of different races of sheep as race characteristics [trans. title], K. Hoffmann (*Landw. Jahrb., 61 (1925), No. 5, pp. 763–778*).—A study of the length, breadth, and shape of the scales of the wool of sheep of the Leicester, Southdown, Hampshire, Rhön, Escurial, and French Merino breeds indicated that these breeds did not differ sufficiently in these characters for serving as a point for differentiating the breeds. The various breeds were, however, found to exhibit definitely different characteristics in the relation of the number of scales to the length and thickness of the wool fibers. From this the area of the fiber covered by the overlapping portion of an average scale was calculated in microns as follows for each

breed: Leicester 662, Southdown 478, Escurial 379, French Merino 377, Rhön 339, and Hampshire 276.

The digestibility and the nutritive value of rye bran of different milling grades and of rye germ by sheep [trans. title], A. SCHEUNERT, W. KLEIN, and M. STEUBER (*Ztschr. Tierzüchtung u. Züchtungsbiol., 3 (1925), No. 3, pp. 343–366*).—The experiments of Honcamp and Pfaff (E. S. R., 54, p. 468) were essentially repeated, using one wether, and similar results were obtained with regard to the digestibility of the different rye mill feeds.

During each period of the experiment the animal was placed in a respiration chamber for 22 hours, during which the gaseous exchange was determined. The basal ration consisted of hay only. The energy values of the rye bran yielding 65, 82, and 95 per cent flour, and the rye germ were calculated from the respiration experiments as 283.4, 170.7, 143.5, and 267.6 calories per 100 gm. of dry matter, and 120.1, 72.3, 60.8, and 113.4, respectively, for the starch value.

The digestibility of the different brans was also determined in another experiment which differed from the first in that the basal ration consisted of 600 gm. of hay and 150 gm. of rye bran from the 65 per cent milling. It was found that the digestibility of the crude fiber was somewhat lower, while the nitrogen-free extract was higher, than in the first experiment.

In both experiments the nutritive value decreased with the larger milling percentages. A comparison of the calculated starch values of the feeds as determined by Kellner's method and on the basis of the respiration experiments showed large differences, calculations from the respiration experiments being much higher.

Grain allowance for pregnant and nursing ewes, D. S. BELL (*Ohio Sta. Bimo. Bul., 11 (1926), No. 1, pp. 15–18*).—The feeding of various proportions of grain and roughage to ewes during pregnancy, parturition, and nursing was studied. The results of three tests indicated that the feeding of equal proportions of concentrates and roughage was uneconomical. In calculating the proportions, however, the corn grain in the corn silage was estimated with the shelled corn and cottonseed meal fed and 3 lbs. of silage was considered to be equivalent to 1 lb. of hay. The total hay equivalent is thus used for the roughage. A ration of 1 part of concentrates to 2 of roughage did not produce sufficient milk. The most satisfactory ration in the experiments consisted of one furnishing a proportion of grain to roughage of 1:3 during pregnancy, 1:2 during lambing, and 1:1 during the nursing period.

Fattening lambs in Arizona, E. B. STANLEY and E. L. SCOTT (*Arizona Sta. Bul. 109 (1925), pp. 43–60, figs. 3*).—The results of two experiments are reported.

Alfalfa-barley pasture for fattening lambs in Arizona—A preliminary investigation.—In studying the practicability of fattening range lambs in Arizona when using irrigated pasture crops, 60 lambs averaging 66.28 lbs. were pastured on 10 acres of alfalfa and barley beginning October 24, 1923. After 37 days the lambs were divided into 2 groups and additional feed was supplied. One lot received milo grain at an average rate of 0.58 lb. per head daily, while the other lot received wheat, but, due to scouring, the amount of the latter feed was reduced to an average of 0.42 lb. per head. After 23 days the grain feeding was discontinued, and alfalfa hay was given during the last 13 days of the experiment. During the first 37 days on pasture the lambs made an average daily gain of 0.326 lb. per head. During the supplemental feeding period of 36 days both lots made an average daily gain of 0.3 lb. per head, but the lambs fed wheat did not appear as thrifty as those fed milo. The grain consumption per 100 lbs. of gain in the 2 lots was 131.82 lbs. of milo and 92.83 lbs. of wheat. Each lot consumed an additional 79

lbs. of hay per 100 lbs. of gain. The authors conclude that the returns per acre from the alfalfa pasture were materially increased by sowing barley with it after the last cutting on September 16. The feeding proved to afford a profitable method of utilizing the winter pasture.

Alfalfa-barley pasture and dry-lot feeding of home-grown grains, 1924–1925.—In this experiment 2 lots of 24 lambs each were fed on 2 4-acre pastures of alfalfa and barley with supplements of shelled corn in 1 lot and cracked hegari in the other during the last 45 days and alfalfa hay during the last 38 days of the experimental feeding period. Six lots of 22 lambs each were used for comparing various rations when fed in dry lot. The initial weight of the lambs averaged approximately 65 lbs., and the feeding periods varied from 67 to 76 days.

Two of the lots were used for comparing shelled corn and cracked hegari when fed with alfalfa hay. The lot receiving shelled corn made an average daily gain of 0.267 lb. and consumed 300 lbs. of grain and 789 lbs. of alfalfa hay per 100 lbs. of gain, as compared with a gain of 0.277 lb. and a feed consumption of 244 lbs. of grain and 941 lbs. of hay by the lot receiving cracked hegari.

Corn silage and hegari silage when fed with rolled barley and cottonseed meal were compared in other lots. The lambs receiving corn silage made an average daily gain of 0.245 lb. and required 1,457 lbs. of silage, 258 lbs. of rolled barley, and 107 lbs. of cottonseed meal per 100 lbs. of gain. Those receiving hegari gained 0.255 lb., and consumed 1,428 lbs. of silage, 237 lbs. of rolled barley, 102 lbs. of cottonseed meal, and 43 lbs. of alfalfa hay (fed during the last 4 days) per 100 lbs. of gain. Two other lots received corn silage and rolled barley, but the protein supplement in one consisted of alfalfa hay and in the other cold pressed cottonseed cake. The average daily gains made by these 2 lots were 0.247 and 0.201 lb. respectively. The former required 967 lbs. of corn silage, 287 lbs. of rolled barley, and 508 lbs. of alfalfa hay per 100 lbs. of gain, as compared with 1,705 lbs. of corn silage, 340 lbs. of rolled barley, 72 lbs. of alfalfa hay, and 145 lbs. of cold pressed cottonseed cake, the feed requirement of the latter group.

Of the 2 lots on pasture the one receiving shelled corn made an average daily gain of 0.262 lb. and consumed 129 lbs. of grain and 266 lbs. of alfalfa hay per 100 lbs. of gain. The other lot on pasture made an average daily gain of 0.228 lb. and consumed 153 lbs. of cracked hegari and 310 lbs. of alfalfa hay per 100 lbs. of gain.

The estimated financial returns from each ration are tabulated, and it is concluded that all lots were fed at a profit but that the returns were greatest from the 2 lots fed on pasture.

Lamb-raising trials, season 1924, E. A. Elliott (*Agr. Gaz. N. S. Wales, 36 (1925), No. 4, pp. 253–256*).—The 1924 lamb-raising trials were conducted similarly to those of 1923 (E. S. R., 52, p. 672).

At the Cowra Experiment Farm, 1 lot of 140 Border Leicester × Merino ewes was mated with Dorset rams, while a similar lot was mated with Ryeland rams. There were 86 lambs born in the lot mated to Dorset rams and 143 in the lot mated to Ryeland rams. In the former lot 77 lambs and in the latter 121 lambs were marked. The gains made by the lambs during 83 days after August 13 were 45.6 and 46.9 lbs. by the ewe and wether lambs sired by the Dorset rams and 43.4 and 37.7 lbs., respectively, by the lambs sired by the Ryeland rams. The Dorset lambs were also about 5 lbs. heavier on August 13.

Two flocks of 110 ewes each were bred to Dorset and Ryeland rams at the Bathurst Experiment Farm. There were 108 and 106 lambs sired by the

respective rams, of which 102 and 95, respectively, were marked. The lambs made average gains from August 6 to December 3 of 38.7 lbs. for those sired by the Dorset rams and 34.7 lbs. for those sired by the Ryeland rams.

Scientific research and pig feeding: A retrospect, C. CROWTHER (*Farmer and Stock-Breeder and Agr. Gaz., n. ser., 39 (1925), No. 1879, p. 2257, fig. 1*).—A popular account of the application of the more recent results of the science of pig feeding.

A comparison of moist and dry feeds for swine [trans. title], M. F. IVANOV and P. F. BUZUK (*Nauch. Agron. Zhur. (Jour. Landw. Wiss.), 1 (1924), No. 2, pp. 154–159*).—For comparing the feeding of moist and dry feed to swine, two lots of 6 pigs each were fed during an 83-day test on a ration of barley, bran, oil cake, beets, and potatoes. The feed given to one lot was fed dry, while the other lot received its feed in the form of a slop. The results showed that pigs fed with dry grain produced more rapid gains, required less grain and less of the beets and potatoes, and produced cheaper and better meat than the lot receiving the grain in the form of a slop.

Rye for fattening hogs, W. E. J. EDWARDS and G. A. BROWN (*Michigan Sta. Quart. Bul., 8 (1925), No. 2, pp. 76–78*).—Five lots of 6 pigs each averaging approximately 125 lbs. in live weight were used for studying the value of rye for fattening swine to 225 lbs. Four of the lots received a mixture of ground oats 50, ground rye 100, tankage 5, and a mineral mixture of 1.55 parts. After the first 30 days the amounts of tankage and minerals were reduced to 4 and 1.54 parts, respectively. In lot 1 the mixture was soaked for 24 hours before feeding, while the feeds for lot 2 were mixed in a slop just prior to feeding. Lot 4 received the same mixture in a self-feeder, and 0.25 lb. of yeast was added per 100 lbs. of mixture and allowed to ferment for 24 hours before feeding for lot 3. The fifth lot was self-fed a mixture of ground rye, tankage, and minerals at the rate of 100 : 4.8 : 1.05 for the first 30 days and 100 : 3.5 : 1.03 for the rest of the period. The average daily gains per head made by lots 1 to 5, given in their numerical order were 1.4, 1.3, 1.5, 1.2, and 1.4 lbs.

The authors conclude that the addition of one-third ground oats to a self-fed ration of rye, tankage, and minerals did not prove advantageous. The fermented ration made somewhat more favorable gains than a similar ration without yeast, but the advantage was not sufficient to cover the extra cost. Soaking produced practically the same gains as unsoaked rations and required more feed. Smaller gains were made on the self-fed ration than where a similar ration was hand-fed and less feed per unit of gain was required by the latter lot.

The influence of small quantities of potassium iodide on the assimilation of nitrogen, phosphorus, and calcium in the growing pig, F. C. KELLY (*Biochem. Jour., 19 (1925), No. 4, pp. 559–568*).—The effects of potassium iodide feeding on the nitrogen, phosphorus, and calcium balances in the pig were investigated in four experiments at the Rowett Research Institute.

Two pigs were used in the first three experiments and 1 in the fourth. The control pig in each case received a basal ration of oatmeal, corn, blood meal, and either barley meal or shorts, with calcium chloride or powdered chalk or both and olive oil. Ten gm. of sugar were also given in the experiments when calcium chloride was fed to mask the bitter taste. The experimental pig in the first three experiments was fed the same as the control pig during a preperiod of from 12 to 16 days. During the next 12 to 16 days, 0.19 gm. of iodine was added daily in experiments 1 and 2 and 0.005 gm. of iodine in the third experiment. A post-period of from 10 to 14 days followed the iodine feeding in each experiment during which time the 2 animals

were similarly fed. The control pig from the third experiment was used for experiment 4. The basal ration was supplemented with 0.003 gm. of iodine daily during 12 days, 0.006 gm. of iodine daily during 10 days, and 0.38 gm. of iodine during another 10-day period. There was no control animal in this experiment.

A study of the composite results of the four experiments indicated that the iodine supplement caused an increased retention of nitrogen and phosphorus, while the control pigs showed a fall in these balances. The increase in the nitrogen retention occurred immediately after the beginning of the iodine feeding. The calcium balances increased with experimental and control animals in all experiments. The amounts of iodine required for positive results were somewhat indefinite, but a dose equal to 0.00038 per cent of the food had no effect while a dose of 0.025 per cent in the ration was effective. The possibility of a physiological influence of iodine in cod-liver oil is suggested.

Developments in poultry research, E. T. Halnan (*Farmer and Stock-Breeder and Agr. Gaz., n. ser., 39 (1925), No. 1873, pp. 1925, 1926*).—A popular review of the changes in poultry practice resulting from experimental feeding and breeding.

The beginner's poultry book, E. T. Brown (*London: Boy's Own Paper Office [1925], pp. 181, pls. 8, figs. 64*).—A popular poultry book, including directions for the construction of equipment.

Washington poultry rations, J. S. Carver and L. W. Cassel (*Washington Col. Sta. Pop. Bul. 133 (1925), pp. 29, figs. 12*).—The general principles of poultry feeding are discussed, with special reference to vitamins and minerals. Rations and feeds are suggested for the different classes of poultry.

The all-mash method of feeding chicks and pullets, D. C. Kennard and R. M. Bethke (*Ohio Sta. Bimo. Bul., 11 (1926), No. 1, pp. 7-14, figs. 4*).—Directions for feeding chicks and pullets by the all-mash method, including discussions of the necessary supplements.

The calcium, phosphorus, and nitrogen balance of the non-laying and laying pullet, E. T. Halnan (*Jour. Natl. Poultry Inst., 10 (1925), No. 9, pp. 410-416*).—The nitrogen, calcium, and phosphorus balances were determined for two White Leghorn pullets for 13 and 14 weeks, respectively, on a ration of wet mash consisting of bran, ground oats, middlings, fish meal, and calcium carbonate, 2 : 1 : 1 : 1 : 0.26, and grain consisting of equal parts of oats and wheat. One of the pullets laid eggs during 4 weeks of the experiment, while the other laid during 6 weeks.

The results showed that large negative nitrogen, calcium, and phosphorus balances occurred only during the laying periods. The largest storage of nitrogen, calcium, and phosphorus occurred in both birds during the first week preceding egg laying. A much greater portion of the nitrogen supplied was retained during egg laying than in the preceding portion of the test. The evidence indicated that the nitgrogen required for egg laying could be largely, if not entirely, supplied by the food during that period. The calcium retention from the food increased from 15 and 17 per cent in the period preceding egg laying to 41 per cent for both birds during egg laying. The retention of phosphorus was not greater during the egg-laying period than during the preceding periods.

A study of the amount of phosphorus secreted showed that the phosphorus and calcium were secreted in the form of tricalcium phosphate. The calculated amounts of phosphorus on the basis of the calcium secreted showed close agreement with the actual during the period when no eggs were laid, but the observed

amount was greater than the calculated during the egg-laying period. This indicates that egg laying is associated with an increased phosphorus catabolism.

The rest period test as a complete substitute for determining the total yearly production of hens by means of the trap nest [trans. title], A. R. WALTHER (*Ztschr. Tierzüchtung u. Züchtungsbiol., 4 (1925), No. 1-2, pp. 91-118, figs. 3*).—The author has made a statistical study of the annual egg production in an individual flock of partridge-colored Leghorns, and correlated and compared the annual production in each year with the heavy production in the 3 months of March, April, and May; April, May, and June; and in the 4 months of March to June, inclusive; and also with 9 or 8 months making up the balance of the year in each case when the rate of production is relatively lower.

The annual production showed a high correlation with the different rest periods, being +0.91 for the period June to February, +0.93 for the period July to March, and +0.86 for the period July to February. The correlation between the 4- and 8-month laying periods in a larger flock of White Leghorns was +0.48. Tabulations showed that the higher annual producers were lower producers on the average during the spring months, but that they maintained their production over the balance of the year. The use of records during the season of low production for the selection of breeding periods is pointed out as advisable. The results are discussed in relation to those of other investigators, especially Dunn (E. S. R., 52, p. 173).

Winter management of the poultry flock, J. A. HANNAH (*Michigan Sta. Quart. Bul., 8 (1925), No. 2, pp. 63-66, fig. 1*).—Popular directions for the feeding and management of the laying flock in the fall and winter.

Shape and weight of eggs in relation to their hatching quality, M. A. JULL and S. HAYNES (*Jour. Agr. Research [U. S.], 31 (1925), No. 7, pp. 685-694*).—The relation of the size and weight of hens' eggs to their hatching qualities has been investigated with several groups of Rhode Island Red and Barred Plymouth Rock hens and pullets by the Bureau of Animal Industry, U. S. D. A.

In the studies of the effect of shape, eggs from 2 flocks each of 12 Barred Plymouth Rock pullets mated to Brown Leghorn cockerels were used. The index of shape was taken as 100 times the maximum breadth divided by the maximum length. A tabulation of the index of 1,253 eggs from the 2 flocks according to fate showed no significant differences in the shape index for infertile eggs and those in which the embryos died early, died late, or hatched, and the relative amount of variability in the different groups was similar. A classification of the total eggs into 3 groups according to the shape index, determinations of the average index for fertile eggs which hatched and those which died in the shell, and determinations of the correlation between the hatching percentages and the shape of the eggs laid by individual pullets indicated that there was no relation between egg shape and hatchability.

In a study of the effect of weight, eggs from the 2 groups of Barred Plymouth Rock pullets were used, as well as eggs from 53 Rhode Island Red hens, 80 Rhode Island Red pullets, 50 Barred Plymouth Rock hens, and 113 Barred Plymouth Rock pullets, all mated to Rhode Island red cockerels. The hatching results and mean weights of the eggs are grouped and tabulated for each breed and separately for different groups and for individuals in the 2 groups of 12 Barred Plymouth Rock pullets, as was done for egg shape, but no significant differences were apparent between the average weights of the infertile eggs and the eggs in which the embryos died early, died late, or hatched. There was no correlation between the mean weights of eggs of individual birds and the percentage of eggs which hatched.

One cause of dead chicks in the shell, W. C. SANCTUARY (*Poultry Sci., 4 (1925), No. 4, pp. 141–143; also in Natl. Poultry Jour., 6 (1925), No. 265, p. 51*).—In preliminary observations of chick embryos dying after the eighteenth day of incubation at the Massachusetts Experiment Station, it has been found that a large percentage of such embryos had their heads between their thighs, while others had the head in the small end of the egg or had their heads twisted to the left side as compared with the normal at the right side. A few cripples were also found. The possibility that handling and turning the eggs influences these characters is suggested, but evidence in support of this assumption is apparently lacking.

Rearing ringneck pheasants, S. E. GORDON (*Penn. Bd. Game Commrs. Bul. 8 (1925), pp. 16, figs. 9*).—This gives general directions for the propagation of ringneck pheasants.

DAIRY FARMING—DAIRYING

The apparent digestibility of low protein rations by dairy cows, A. E. PERKINS and C. F. MONROE (*Jour. Dairy Sci., 8 (1925), No. 5, pp. 405–414*).—In continuing the study previously noted (E. S. R., 51, p. 875), the apparent digestibility of a low protein ration was determined with 4 Holstein-Friesian cows during 2 periods of 18 days each, separated by a 12-day interval. Two of the cows had previously received a low protein ration for several months, while the other two had been on pasture and had received an abundant protein ration. The cows were producing approximately 30 lbs. of milk per head daily. The experimental ration was made up of wheat bran, ground corn, ground oats, dried beet pulp, cane molasses, and timothy hay, fed in sufficient amounts to give a nutritive ratio of approximately 1:11. One of the cows of each pair was given distilled water to drink, while the other received well or tap water. The kind of water was reversed in the second period.

The results showed no significant differences in the digestibility of the ration resulting from the kind of water received or the previous rations of the cows. The average digestibility of all nutrients was lower for these animals than the average digestible coefficients calculated according to Henry and Morrison (E. S. R., 48, p. 600) for this ration. The observed and calculated coefficients were, respectively, dry matter 63.1 and 70 per cent, crude protein 52.8 and 64, ether extract 36 and 76, crude fiber 46.1 and 58, and nitrogen-free extract 72.9 and 80 per cent. The results are compared with the results of the authors' earlier experiments and with those of other investigators.

One of the cows used in this experiment which had received a similarly low protein ration in an earlier study did not show such a great depression in the digestibility of the ration at that time. Clover hay was included in the earlier ration, but no molasses or oats were fed. The effect of starches and sugars in depressing digestibility in other investigations is noted. It did not appear that the apparent decrease in the digestibility of this low protein ration was accompanied by a decrease in the productive efficiency of the ration as judged by the live weight and condition of the cows.

New observations and a reinterpretation of old observations on the nutritive value of the wheat plant, E. B. HART, H. STEENBOCK, G. C. HUMPHREY, and R. S. HULCE (*Jour. Biol. Chem., 62 (1924), No. 2, pp. 315–322, figs. 3*).—A complete account of investigations previously noted from the Wisconsin Experiment Station (E. S. R., 53, p. 473.)

Feeding cows insect-infested coconut meal, R. W. DOANE (*Jour. Econ. Ent., 18 (1925), No. 5, pp. 689–696, figs. 2*).—The feeding experiments reported

show that dairy cows will eat the coconut meal made from infested copra cakes as readily as that made from uninfested cakes, and that there is no difference in the amount of milk produced nor the total solids, butterfat, or proteins.

The value of calcium phosphate as a supplement to the ration of dairy cows, J. B. LINDSEY and J. G. ARCHIBALD (*Jour. Agr. Research [U. S.], 31 (1925), No. 8, pp. 771–791, pls. 4, fig 1*).—A progress report is given of the results at the Massachusetts Experiment Station of supplementing a low calcium ration with calcium phosphate for dairy cows and heifers.

The experimental animals were divided into two groups, the one receiving the ration with the supplement of calcium phosphate, while the other group received none of the latter material. The 2.5 years' results indicate that the aged cows, the young Holestein cows, and the heifers kept on these rations have shown no ill effects in either case, but the young Jersey cows have exhibited a general unthrifty appearance and they did not do well on either ration. No significant differences in the changes in body weight of the cows on the two rations were apparent. The young Jersey cows did not milk as well as was expected, but the other cows have shown no effect in yield from either ration. There was a slightly higher calcium content in the milk from the cows receiving the minerals, but no other effects in the composition of the milk were appreciable. There was considerable difficulty in getting the cows in calf, but this was equally divided between the two groups. Approximately the same numbers of strong, healthy calves were produced by both groups, but the cows not receiving the mineral supplement produced more delicate calves.

Mixed feed service, J. E. BURNETT (*Michigan Sta. Quart. Bul., 8 (1925), No. 2, pp. 69, 70*).—A formula of a mixed dairy feed is suggested, primarily for the use of local millers or cooperatives.

Economic feeding on Massachusetts dairy farms, C. J. FAWCETT (*Mass. Agr. Col. Ext. Leaflet 89 [1925], pp. 6, fig. 1*).—A presentation of the more economical feeding of the maximum amount of home-grown leguminous roughage and corn silage and less purchased grain for milk production.

Improving dairy cattle by the continuous use of the proved sire, R. R. GRAVES (*Jour. Dairy Sci., 8 (1925), No. 5, pp. 391–404, fig. 1*).—The inheritance of milk and fat production in dairy cattle is discussed, from which it appears that the multiple factor hypothesis receives a little more support than the idea of complete dominance of a number of factors. It is suggested that in either case the use of proved prepotent sires for generation after generation would be most likely to produce individuals that would breed true for high milk and butterfat production.

A dairy cow, Grace Daw 2d, and her progeny (*Ohio Sta. Bimo. Bul., 11 (1926), No. 1, pp. 3–6, figs. 5*).—The milk and butterfat records of a cow, her daughters, granddaughter, and great-granddaughters are given to show that practically all the descendants of this cow when mated with good bulls were profitable producers.

Dairy cow testing in different countries (*Rome: Internatl. Inst. Agr., Bur. Agr. Sci., 1925, pp. IV+115*).—Methods of conducting cow testing associations in different countries are described, including a general discussion of the methods employed and suggestions for improvement.

The development of the dairy industry in India, W. SMITH (*Internatl. Rev. Sci. and Pract. Agr. [Rome], n. ser., 3 (1925), No. 3, pp. 781–787*).—A brief account of conditions in dairying in India.

Report of the proceedings of the forty-fourth annual convention of the Connecticut Dairymen's Association, held at Unity Hall, Hartford,

Conn., January 6–7, 1925 (*Conn. Dairymen's Assoc. Rpt. Proc., 44 (1925), pp. 116, pl. 1*).—The usual report of this association (E. S. R., 52, p. 676).

Milk and milk adulteration, A. J. J. VANDEVELDE (*Over Melk en Melkvervalsching. Antwerp: "De Sikkel," 1925, 3. ed., pp. 112, fig. 1*).—The results of a study of the normal composition of milk and the changes in the composition of modified milk are given.

Urban milk supply, M. GRIMES (*Univ. Col., Cork, Agr. Bul. 1 (1925), pp. 80, pls. 7*).—The importance of clean milk for human consumption is discussed, and the results of various tests on milk obtained from dairymen in the city of Cork, Ireland, are given in detail. Desirable regulations in force in other cities are also noted.

Relation between the bacterial count of whole milk and that of the cream and skim milk separated from it, C. S. LEETE (*Jour. Agr. Research [U. S.], 31 (1925), No. 7, pp. 695–699*).—The results are reported of investigations in the Bureau of Dairying, U. S. D. A., on the bacterial count as determined by the plate method of whole milk and the cream and skim milk separated from it by a centrifugal separator and by gravity. One hundred samples of whole milk having bacterial counts ranging from 9,000 to 14,410,000 and averaging 435,240 per cubic centimeter were separated by the centrifugal method. The bacterial counts of the cream from this milk ranged from 7,000 to 18,600,000 and averaged 500,830 per cubic centimeter. The bacterial counts of the skim milk ranged from 9,000 to 7,500,000 and averaged 312,740. In 70 of the samples which showed increases in the count of the cream as compared with the whole milk, the average increase was 23.87 per cent, and in 23 samples showing decreases the average decrease was 14.06 per cent. Seven of the samples showed no change. Twenty-five samples of whole milk ranging in bacterial count from 2,000 to 850,000 and averaging 135,880 per cubic centimeter were separated by the gravity method. The bacterial counts of the cream from such milk ranged from 5,000 to 1,700,000, averaging 283,680. The bacterial counts of the skim milk ranged from 900 to 180,000 and averaged 33,556.

The author concludes that gravity-separated cream shows a much higher increase in bacterial count than cream separated by the centrifugal method, but that there appears to be no reason for the custom of allowing much higher bacterial counts for cream than for milk in many milk ordinances.

The electric current (apart from the heat generated): A bacteriological agent in the sterilization of milk and other fluids, J. M. BEATTIE and F. C. LEWIS (*Jour. Hyg. [London], 24 (1925), No. 2, pp. 123–137, figs. 2*).—The results of several experiments dealing with the lethal effect of an electric current on bacteria are reported from the University of Liverpool.

The fluids, which included milk and water inoculated with *Bacillus tuberculosis* or *B. coli*, were treated with the electricity as they flowed through a tube having electrodes installed at different points. The temperature of the fluid was recorded at the outlet of the tube.

The treatment lasted for only a few seconds in any specific amount of the milk and the temperature did not rise above 64° C. (147.2° F.) in the usual test. Milk rich in *B. tuberculosis* when passed through the tube and treated with sufficient electric current so that the outlet temperature was from 62 or 63 to 64° failed to produce tuberculosis in guinea pigs, but slight infections occurred when the guinea pigs were inoculated with milk in which the temperature was raised to 60 to 62° as a result of the treatment. Generalized tuberculosis occurred in guinea pigs inoculated with milk previous to treatment.

Several experiments with other forms of heat using water and milk inoculated with *B. coli* showed that heating the fluids to much higher temperatures or for longer periods was required for destruction than were attained in the experiments in which the electric current was used.

The authors conclude that the lethal effect of the electric current is not due to the heat generated but rather to the conduction of the electricity through the bacteria themselves. The efficiency of the electrical apparatus is concluded to be due to the high tension current used in combination with the correct time of exposure.

Butter and cheese, G. S. THOMSON (*London: Crosby Lockwood & Son, 1925, pp. 95, figs. 17*).—This consists mainly of brief accounts of the factors determining quality in butter and cheese, including descriptions of various defects.

The bacterial content of ice cream, N. E. OLSON and A. C. FAY (*Jour. Dairy Sci., 8 (1925), No. 5, pp. 415–444*).—In continuing the studies of the bacterial content of ice cream (E. S. R., 52, p. 880), the various ingredients in the mix were sampled during the different stages of manufacture at six commercial plants in order to determine the average bacterial content of commercial ice cream and to show the amount of improvement which could be effected by practicing better sanitation.

The samples were taken on four different days at each plant, the first two days being for determinations of the average commercial count. During the second two days at each plant the ice cream was manufactured under the direction of the investigators, special care being given to cleanliness and sterilization of utensils.

The combined results showed that the average count of the unsupervised finished ice cream from all plants was 390,225 bacteria per gram, while the average count of the supervised ice cream was only 39,127 per gram. These results thus indicate that it is practical to produce ice cream containing less than 100,000 bacteria per gram provided efficient pasteurization is practiced and the temperature is controlled during aging, and the equipment is properly washed and sterilized.

The bacterial content of the ingredients indicate that cream and milk are the most important sources of contamination, though condensed milk may at times add considerable numbers to the raw milk. Gelatin, water, and sugar were negligible factors. The use of alkaline washing powder, hypochlorite solutions, and sterilized equipment were essential. Pasteurization at 145° F. for 30 minutes, followed by homogenization, resulted in counts of less than 100,000 bacteria per gram in the finished product, even with raw mixes containing as high as 34,000,000 bacteria per gram.

VETERINARY MEDICINE

Diseases of domestic animals, P. J. CADIOT, G. LESBOUYRIES, and J. N. RIES (*Traité de Médecine des Animaux Domestiques. Paris: Vigot Bros., 1925, pp. VII+968, figs. 2*).—This treatise is divided into four parts, the first of which (pp. 7–686) deals with affections of the digestive apparatus, urinary organs, respiratory apparatus, circulatory apparatus, nervous system, and skin; the second with diseases of the blood and malnutrition (pp. 687–760); the third with intoxications (pp. 761–848); and the fourth part with infectious diseases (pp. 849–957).

[Report of the] health of animals branch [Canada] (*Canada Min. Agr. Rpt., 1925, pp. 31–40*).—A brief report of the work of the year with diseases of livestock.

Report on the Civil Veterinary Department, Burma (including the Insein Veterinary School), for the year ended the 31st March, 1925, A. Blake (*Burma Civ. Vet. Dept. Rpt. 1925, pp. [6]+27, pl. 1*).—The work of the year (E. S. R., 52, p. 776) with infectious diseases of livestock, including preventive inoculation, etc., is reported upon.

Annual report of the chief veterinary research officer, division of veterinary research, Kabete, J. Walker (*Kenya Colony Dept. Agr. Ann. Rpt. 1924, pp. 63–93*).—This report (E. S. R., 52, p. 776) includes accounts of the occurrence of and work conducted with infectious diseases of livestock.

Chemical examination of three delphiniums, O. A. Beath (*Wyoming Sta. Bul. 143 (1925), pp. 49–70, figs. 11*).—This is an account of investigations conducted in continuation of those previously reported (E. S. R., 41, p. 407). The three species considered are *Delphinium bicolor* and *D. nelsonii*, commonly referred to as low larkspurs, and *D. cuculatum*, a tall species. *D. bicolor* and *D. cuculatum* are responsible for cattle losses in those areas predominantly infested by these plants. The important chemical relationships of the two are considered at some length. *D. nelsonii*, which occurs widely distributed, being occasionally found in dense patches, is under present range conditions classed as practically harmless to cattle.

Immunochemical studies, edited by C. H. Browning (*London: Constable & Co., 1925, pp. XIII+239*).—This volume reports investigations upon humoral aspects of immunity by six authors, as follows: On Antibody Action in General, by C. H. Browning (pp. 1-18); Properties of Antigens as Exemplified by Globin and Haemoglobin (pp. 19-39) and Mature and Immature Antibodies—Alterations in Haemolytic Immune Body Which Occur during the Process of Immunisation (pp. 40-54), both by C. H. Browning and G. H. Wilson; Constituents of Serum Which Influence Antibody Action—The Natural Haemolysin of Ox Serum for Guinea-Pig Blood and Conglutination, by N. Yoshinare (pp. 55-79); The Effect of Osmic Acid and Other Agents on the Affinity of Receptors for Immune Bodies and on Their Antigenic Properties, by M. Kosakai (pp. 80–102); Heterophile Antigen and Antibody, by T. Taniguchi (pp. 103–167); Opsonic Action, by C. H. Browning (pp. 168–179); and Complement, by C. H. Browning and T. J. Mackie (pp. 180–237).

New phases in the control of anthrax through vaccination, A. Eichhorn (*Jour. Amer. Vet. Med. Assoc., 68 (1925), No. 3, pp. 276–284*).—The author points out that, in the control of anthrax by vaccination, it is desirable to employ a vaccine which induces a local or general reaction. Such a vaccine, of proper standardization, induces a maximum degree of immunity which will protect the animals through the period of the anthrax season. Local and general reactions, as a rule, do not endanger the life of the animal, and subside without any interference. Direct losses from the vaccination are very insignificant and should not discourage the use of such a vaccine in badly infected anthrax districts. For some unknown reason, horses appear to be more responsive to such a vaccine than mules and cattle, the losses following the vaccination having been limited practically to horses. Owners should be informed of the occurrence of such reactions, and also of their advantages. Effective immunization in notorious anthrax districts will be possible only by employing a vaccine inducing reactions.

Recent investigations on blackleg immunization, J. P. Scott (*Jour. Amer. Vet. Med. Assoc., 67 (1925), No. 5, pp. 623–631*).—This is a contribution from the Kansas Experiment Station in which the results of investigations under way are summarized. A report of the experiments has been noted from another source (E. S. R., 53, p. 884).

The presence of specific antibodies in the serum of rabbits parasitized by *Coenurus serialis* [trans. title], URBAIN and CHRÉTIEN (*Rec. Méd. Vét., 101 (1925), No. 18, pp. 329–331*).—The authors' investigations confirm the findings of Henry and Ciuca in 1914 (E. S. R., 32, p. 180) and 1916 [3] that rabbits parasitized by *C. serialis* elaborate antibodies (amboceptor and precipitin) specific for this Coenurus.

The pathogenic activity of the virus of foot-and-mouth disease in the rabbit [trans. title], S. NICOLAU and I. A. GALLOWAY (*Compt. Rend. Soc. Biol. [Paris], 93 (1925), No. 34, pp. 1283, 1284*).—The authors find the virus of foot-and-mouth disease from the guinea pig to be virulent for the rabbit, in which it produces a local lesion of the tongue. No other visible symptoms are produced.

A study of rabies, with reference to a neural transmission of the virus in rabbits, and the structure and significance of Negri bodies, E. W. GOODPASTURE (*Amer. Jour. Path., 1 (1925), No. 6, pp. 547–582, pls. 2*).—The author found it possible to infect rabbits with rabies fairly regularly by inoculating them with street virus into the right masseter muscle. "The majority of animals thus inoculated and permitted to live long enough to develop muscular symptoms showed evidences of paralysis first in the fore legs and more often on the side of the inoculation. It is believed that the virus enters the central nervous system through nerves supplying the inoculated muscle. A method of staining to demonstrate Negri bodies is described. A distinction is drawn between Negri bodies and 'lyssa bodies,' based on structural differences. 'Lyssa bodies' were much more numerous in these animals than typical Negri bodies.

"Following an inoculation of the virus into the right masseter muscle 'lyssa bodies' or Negri bodies were always demonstrable in the right motor nucleus of the fifth cranial nerve, but also in the left nucleus and widely distributed in the central nervous system. The most severe lesions, however, were always found in the pons, medulla, and cervical cord, and apparently more extensive on the right side. Ammon's horns were usually only slightly affected. Lesions in the sensory division of the fifth cranial nerve and in the cells of the corresponding Gasserian ganglion suggest an axis-cylinder transmission of the virus.

"A degenerative change in the neurofibrillar substance of ganglion cells and their processes is described which leads to the formation of bodies identical with 'lyssa bodies' and with the eosin-stainable substance of Negri bodies. It is believed that 'lyssa bodies' are formed directly from such an alteration of neurofibrillar material in a portion of the living cell, with or without the inclusion of inner structures. Degenerative changes are described in the mitochondrial material of axis-cylinders and nerve cells leading to the formation of structures which closely resemble the 'Innenkörper' of Negri bodies. It is believed that the typical Negri bodies are formed within the living cell by a focal degeneration of neurofibrillar material which melts together and coagulates or coheres about one or more of the structures which result from mitochondrial degeneration. The inclusion of these bodies gives the characteristic architecture to Negri bodies which alone serves to distinguish them from 'lyssa bodies.'

"The type of degeneration of mitochondrial substance in axis cylinders and nerve cells is, so far as we are aware, specific for rabies, in that small bodies are formed which stain deeply with Loeffler's methylene blue after acid fuchsin. It is believed that neither the virus of rabies nor a constant struc-

[3] Ann. Inst. Pasteur, 30 (1916), No. 4, pp. 163–179.

tural change associated with its presence has yet been demonstrated microscopically. All the structural changes observed appear to be degenerative in origin. The hypothesis is advanced that the degenerative changes observed in axis cylinders are the result of the passage of the virus along these processes, and indicate its manner of extension from one focus to another. The material resulting from the degeneration of mitochondria may serve as a favorable medium for the growth and spread of the virus."

Prophylactic immunization of dogs against rabies by a single injection of a dead-virus vaccine, A. S. Schlingman (*Jour. Amer. Vet. Med. Assoc., 68 (1925), No. 3, pp. 299–305*).—The author describes a dead-virus antirabic vaccine made from the cords and brains of dogs previously infected with fixed virus. In experiments conducted 5 cc. of this vaccine produced no untoward symptoms and was found ample to protect dogs against relatively large amounts of intracranial infection. Coupled with proper quarantine measures, the vaccine can be recommended for the control of rabies in dogs.

Anti-rabic procedure in Palestine with special reference to decentralization of treatment, G. Stuart and K. S. Krikorian (*Ann. Trop. Med. and Parasitol., 19 (1925), No. 4, pp. 391–418*).—This is a contribution from the laboratory section of the Palestine Department of Health.

Carbolized antirabic vaccine is said to be an efficient and safe treatment by which persons bitten by rabid animals can be treated at or near their own homes, thus saving the expenses connected with travel to, and residence in, a strange town. Carbolized vaccine can be manufactured without additional staff in any well-equipped laboratory, and can be distributed to treatment centers, where as good results attend its use as at the place of its production. Better results have followed a dosage of 5 cc. daily of a 1 per cent emulsion over 14 days than of 2 cc. of the same emulsion over the same period. Carbolized vaccine is most practicable in the curative and prophylactic treatment of farm animals, being easily administered in rural districts by veterinary officers.

The location and longevity in calves of Bacterium abortum ingested with milk, and its effect on the agglutination titre of their blood, G. H. Hart and G. M. Woods (*Hilgardia [California Sta.], 1 (1925), No. 10, pp. 203–226*).—In investigations here reported the authors have demonstrated that *B. abortum* ingested by calves with milk finds its way to the lymph glands along the alimentary canal, particularly to those about the head, and, in some cases, gains access to the blood stream as evidenced by its frequent recovery from the spleen.

"These organisms do not remain permanently located in the body tissues of the calf. A few weeks after infection ceases the organisms are no longer found. The longest period in which they were found after infection ceased was 7 weeks in one case in the atlantal lymph gland and 11 weeks in another case in the submaxillary lymph gland. No difference between male and female calves was observed in this connection. The feeding or withholding of colostrum also had no effect on the result. Although the period between the time infected milk was withdrawn and pregnancy was established in the animals that were allowed to reach maturity (7 to 13 months) was much shorter than normally occurs in dairy farm practice, none of them showed any evidence of *B. abortum* infection. The ingestion by calves of large quantities of virulent *B. abortum* organisms in milk, followed by their gaining access to certain lymph glands and other body tissues, including the blood stream, does not, with occasional exceptions, result in the production of agglutinins in the blood of these animals. The testing of the blood of calves up to the time they are from 9 to 12 months of age is, therefore, of

no value in herds where the disease is being controlled by the agglutination test and isolation of reactors. Greater morbidity and mortality were experienced among the calves that did not receive colostrum. Nevertheless, we were able to raise calves without colostrum, and its feeding did not, in all cases, stop the development of serious and even fatal gastrointestinal disturbances."

Abortion-bacterin treatment of cows having udders infected by Bacterium abortus, J. M. BUCK and G. T. CREECH (*Jour. Agr. Research [U. S.], 31 (1925), No. 7, pp. 663–684*).—In this further contribution (E. S. R., 52, p. 383) the authors describe the methods used and the results obtained in an attempt to overcome *B. abortus* udder infection by repeated subcutaneous administrations of *B. abortus* bacterin. The experimental work was carried out in a herd of approximately 200 dairy cattle in which infectious abortion had prevailed for about five years. An agglutination test of this herd showed that the blood serum of 22 cows caused clumping of a *B. abortus* suspension in amounts as small as 0.001 cc., and that the end point in the case of 8 others was 0.002 cc.

The authors found that repeated injections of the bacterin, in which the organisms had been killed by heat, did not prove to be of practical value in overcoming *B. abortus* udder infection in cows. Eight of a group of 15 cows with udders infected by *B. abortus* produced milk capable of infecting guinea pigs for approximately two years. Variations in the quantity of milk produced by a *B. abortus* udder-infected cow did not markedly affect the agglutination reaction of the milk whey, provided the animal was milked daily. It was found that the blood serum of cows which have acquired infectious abortion may react strongly to the agglutination test for at least a year after the disappearance of the infection from the udder, as indicated by guinea pig inoculation tests.

Further report on the injection of cattle with B. tuberculosis (avian), C. ELDER and A. M. LEE (*Wyoming Sta. Bul. 140 (1925), pp. 3–12*).—This is a report of work conducted in continuation of that previously noted (E. S. R., 50, p. 381; 51, p. 284).

The authors found that calves which were injected with virulent avian tubercle bacilli and which developed local lesions gave good positive tuberculin reactions when given the intradermal test. It was found possible by a surgical operation to remove completely the local lesions produced by experimental inoculation. Five months after removal of these local lesions the calves failed in each case to react to the intradermal, ophthalmic, and subcutaneous tuberculin tests. The local lesions which were removed resembled greatly the lesions which are observed and described in the skin form of tuberculosis.

It is concluded that avian tubercle bacilli tend to remain localized when they gain entrance through the skin to the subcutaneous tissues even when introduced in large numbers. Microscopical examination of the local lesions demonstrated the presence of tubercle bacilli in them eight months after the tubercle bacilli had been introduced. Work done with chickens would tend to indicate that these organisms found in the lesions were still alive at the time the local lesions were removed. No new lesions developed after surgical removal.

A new method for the concentration of bacilli in tuberculous milk, S. R. DOUGLAS and L. J. MEANWELL (*Brit. Jour. Expt. Path., 6 (1925), No. 5, pp. 203–206*).—The authors describe a method of concentration by means of which the microscopical examination of milk for the presence of tubercle bacilli is made more reliable. Out of 30 samples of tuberculous milk, 26 were positive miscroscopically by the use of this method, while by the routine method tubercle

bacilli were only demonstrated 10 times. Preliminary experiments indicate that a similar method may be successfully applied by the examination of certain other pathological material.

Nasal granuloma in cattle, V. KRISHNAMURTI AYYAR (*India Dept. Agr. Mem., Vet. Ser., 3 (1925), No. 6, pp. 159–166, pls. 9*).—This is an account of a widespread disease condition among cattle in the Madras Presidency and some other parts of India, characterized by the development of chronic granulomatous formations upon the nasal mucous membrane. The disease appears to be of an infective origin. Clinically, it is manifested by a snoring noise due to the obstruction of the nasal passages, and aggravated by any condition which causes increased respiration. The disease is said to be seldom fatal. Histologically, the lesion resembles closely that of *Actinomycosis bovis* Harz, and, in the tissue follicles composed of connective tissue elements, granules very similar in appearance and texture to the so-called "ray-fungus" of actinomycosis can be readily demonstrated.

Some parasites of British sheep, W. C. MILLER (*Glasgow: Robert Young & Co., 1925, pp. 106, pls. 16, figs. 3*).—This small handbook deals with insect parasites (pp. 13–38), arachnid parasites and diseases (pp. 39–73), certain other diseases of sheep (pp. 73–94), and dipping (pp. 95–106).

Worm parasites of domesticated animals.—Parasites of swine, M. C. HALL (*[Chicago]: L. A. Merillat, 1924, pp. 160, figs. 129*).—The five chapters of this work deal with the parasites infesting swine as follows: Flukes (pp. 7–29), tapeworms (pp. 30–47), nematodes (pp. 48–140), acanthocephalids (pp. 141–146), and linguatulids (pp. 147–152).

Some common diseases of poultry, H. EMBLETON (*Arizona Sta. Timely Hints for Farmers, No. 153 (1925), pp. 14*).—This is a practical summary of information.

Bacterium pullorum studies, W. L. MALLMANN (*Michigan Sta. Tech. Bul. 68 (1925), pp. 5–29, figs. 2*).—The first of the three parts of this bulletin deals with investigations of variations in cultural, physiological, and morphological characteristics (pp. 5–17). These studies of *B. pullorum*, repeated once each year for three consecutive years, showed that a great many characteristics, particularly physiological properties, vary considerably, and further that these variations were not constant. The kind of medium used for invigorating the cultures, the extent of invigoration or the lack of invigoration, and the kind of broth used for preparing the sugar solutions apparently have little or no influence on gas production.

Part 2 deals with a study of the agglutinability of 47 strains (pp. 18–26). The strains were found to vary in their ability to be agglutinated, some being quite consistent in their relations to the sera studied while others are extremely erratic. In using strains of *B. pullorum* for antigen, it is advisable to select only those strains that show high titers toward all sera used and that are consistent. In selecting strains for agglutination purposes, it is important (1) that the culture be a pure strain of *B. pullorum*, one in which all sugar fermentation characteristics are typical, (2) that the culture have a high agglutinability, and (3) that the titer be constant or nearly so on all sera tested. While the stability or keeping quality of stock antigen is not known definitely, assuming that it will keep for six months it would be advisable to select such strains as suggested and make up large quantities of antigen at one time, and thus avoid having to examine cultures frequently for agglutinating value. The use of standard cultures of antigen, or, even better, standardized *pullorum* antigen, is suggested, so the laboratory man may be sure that his results are the best obtainable.

In part 3 the keeping quality of *B. pullorum* antigen is considered (pp. 27–29). It was found that the antigen prepared for the agglutination test in bacillary white diarrhea can be kept in a refrigerator at a temperature of approximately 10° C. generally for about 12 months.

Coccidiosis of chickens, J. R. BEACH and D. E. DAVIS (*California Sta. Circ. 300 (1925), pp. 15, figs. 5*).—A summary of information on this serious affection of poultry, which is said to be so widespread in poultry districts that practically all established poultry farms are infected and new farms quickly become so.

The value of various feeds in the control of coccidiosis in chicks, R. M. SHERWOOD (*Texas Sta. Bul. 331 (1925), pp. 3–14, figs. 8*).—This is a report on the first of a series of experimental investigations of the value of food materials and methods of management in the control of coccidiosis.

It was found that the feeding of buttermilk to chicks artificially infected with *Eimeria avium* at 11 and 12 days of age materially decreased the mortality. The mortality for the lots getting no buttermilk was 63.6 per cent, for those fed the condensed buttermilk diluted in the proportion of 1 qt. to 6 qt. of water 44.8 per cent, and for those fed condensed buttermilk diluted in the proportion of 1 qt. to 3 qt. of water only 26 per cent.

"No advantage was gained by the use of greens except in the case of a lot which received greens and no buttermilk. In this lot the loss was only 38.3 per cent, while it was 69.9 per cent and 82.6 per cent in the other two lots receiving no buttermilk. Other data are needed to prove whether or not this lower loss was due to the feeding of greens. No advantage was gained by the use of cod-liver oil up to the time the chicks were eight weeks of age, when the disease is considered to have run its course. The gain in weight was greatest with the chicks receiving the 1–3 buttermilk and smallest with those receiving no buttermilk. The amounts of grain, mash, and milk consumed were in proportion to the gain in weight."

Tuberculosis of fowls, C. ELDER and A. M. LEE (*Wyoming Sta. Bul. 142 (1925), pp. 31–48, figs. 8*).—A summary of information on this disease of poultry and means for its control.

Fowl typhoid, C. C. PALMER (*Vet. Alumni Quart.* [*Ohio State. Univ.*], *13 (1925), No. 3, pp. 71–85*).—This account deals particularly with the diagnosis and control of fowl typhoid.

The possible transmission of fowl typhoid through the egg.—Preliminary report, F. R. BEAUDETTE (*Jour. Amer. Vet. Med. Assoc., 67 (1925), No. 6, pp. 741–745*).—This is a preliminary report of investigations conducted at the New Jersey Experiment Stations.

The author records having isolated what appears to be the fowl typhoid organism, *Bacterium sanguinarium*, from young chicks on several occasions during the year, and also from the unabsorbed yolk of a young chick, and in another instance from the ovary of an adult hen. In agglutination tests made of 66 blood samples collected from the flock in which an ovary infected with the typhoid organism had been found, 9 agglutinated both the *B. pullorum* and *B. sanguinarium* antigens. No difference in agglutination could be determined. With a view to determining the titer limit for these antigens, progressive dilutions were made from 1–40 to 1–1,280 and incubated for 24 hours, but hardly any difference in results was observed. The details of the agglutination tests are presented in tabular form.

The author concludes that the isolation of *B. sanguinarium* from the heart blood of baby chicks coming from different flocks indicates that the infection is quite common in young stock. The presence of the organism in the unabsorbed yolk of a chick five weeks old is thought to indicate the possibility

that this chick might have been infected through the egg. It is pointed out that the finding of the organism in a pathological ovary of an adult hen affords a parallel to that found in bacillary white diarrhea. A post-mortem examination alone would be of no value in differentiating between the two infections, for the appearance of an ovary infected with *B. sanguinarium* does not differ from one infected with the white diarrhea organism. The organisms causing these two infections are so closely related serologically that the agglutination test for carriers of *B. pullorum* would eliminate as well the fowls infected with *B. sanguinarium*.

Studies on the avian species of the cestode family Hymenolepididae, R. L. MAYHEW (*Ill. Biol. Monog., 10 (1925), No. 1, pp. 125, pls. 9, figs. 2*).—A revision of the genus Hymenolepis is made on the basis of the arrangement of the testes, with a division of the species assigned to it into three genera. Fourteen species belonging to the family are described as new to science. A bibliography of seven pages is included.

AGRICULTURAL ENGINEERING

Co-ordination of irrigation and power, W. KELLY (*Amer. Soc. Civ. Engin. Proc., 51 (1925), No. 10, [pt. 3], pp. 1946–1984, figs. 16*).—A detailed presentation of the factors entering into the problem of coordination of irrigation and power in the Western States is given. Certain solutions are pointed out by describing some of the specific cases that have come before the Federal Power Commission.

Public Roads. [December, 1925] (*U. S. Dept. Agr., Public Roads, 6 (1925), No. 10, pp. 213–232+[2], figs. 6*).—This number of this periodical contains the status of Federal-aid highway construction as of November 30, 1925, together with the following articles: The Motor Bus As a Common Carrier, by H. R. Trumbower; and Efficiency in Concrete Road Construction.—Part II, The Transportation of Materials, by J. L. Harrison.

Foundation test loads as affected by scale, S. D. CAROTHERS (*Engin. and Contract., Buildings, 64 (1925), No. 4, pp. 939–945*).—This is an abstract of a report of studies of the dynamics of soil foundations presented before the International Mathematical Congress at Toronto.

The results showed that the narrower the strip the greater the load which can be carried per foot on any given foundation. If at a certain depth there is a layer of frictionless material it will be necessary, if the depth is equal to half the width, to limit the load on the surface to a very small amount in order to avoid tension and retain the stress difference within reasonable limits.

If test holes indicate that the quality of the soil becomes softer with depth, then the wider the strip the less average load per foot will it carry. If the pressures on horizontal and vertical planes are equal at all points, then all widths of strip should carry the same intensity of loading, provided the soil does not vary with depth. If the pressure on vertical planes is greater than that of horizontal planes, then the maximum stress difference occurs at the edges of the loaded strip and all widths of strip should carry the same intensity of loading, provided the soil does not vary with depth.

Strength of materials, A. P. POORMAN (*New York and London: McGraw-Hill Book Co., 1925, pp. XI+313, figs. 211*).—This book, based on procedure at Purdue University, contains chapters on elastic stresses and deformations—tension and compression, ultimate stresses and deformations—tension and compression, shearing stresses and deformations, riveted joints, shear and moment in beams, stresses in beams, deflection of cantilever and simple beams, fixed and continuous beams, beams of constant strength, beams

of two materials, resilience in beams, torsion of shafts, combined stresses, Euler's, Rankine's, and straight line column formulas, columns in general, deflection of beams by area moment method, deflection of beams by equivalent cantilever method, and curved beams and hooks.

Cohesion in colloidal soils, F. HARDY (*Jour. Agr. Sci.* [*England*], *15* (*1925*), *No. 4, pp. 420–433*).—Studies conducted at the Imperial College of Tropical Agriculture, Trinidad, are reported in which were measured the resistances to transverse breaking, crushing, and parting under tensile pull of standard blocks of soil prepared in different ways and under particular moisture conditions. The soils tested comprised three highly colloidal siliceous soils containing amounts of calcium carbonate ranging from 7.2 to 0.2 per cent and two red lateritic soils.

The most significant results were obtained by employing, in a special tenacity apparatus, granular test blocks, prepared by moistening sieve-graded dry soil packed into rectangular molds. The results thus obtained are believed to furnish a reliable measure of the cohesiveness of soil colloidal matter, especially in soil blocks that have previously been brought to a constant moisture content in a humidifier. The method of preparation simulated the effect of rain in causing the running together of colloidal soil particles.

The relative cohesiveness of the soils appeared to follow the same order as their rates of settling from aqueous suspension. This observation is considered to strengthen the view that cohesiveness in colloidal soils is to a certain extent due to chemical forces that depend on the presence of active atoms or atomic groups possessing powerful fields of residual affinity, although film tension probably also plays a part.

Studies in the physical properties of soils, II, III, W. B. HAINES (*Jour. Agr. Sci.* [*England*], *15* (*1925*), *No. 4, pp. 529–543, figs. 6*).—The second and third contributions to the subject from the Rothamsted Experimental Station are presented (E. S. R., 54, p. 177).

II. *A note on the cohesion developed by capillary forces in an ideal soil* (pp. 529–535).—A calculation is made of the cohesion due to the capillary attraction between the particles of an ideal soil when wetted. Experimental verification of this theory is afforded by cohesion tests on the ignited silt fraction separated from soil. The measurements of cohesion were made with Atterberg's apparatus, which indicates the force necessary to overcome the cohesion of a block of the material under test by means of the penetration of a steel wedge.

The experimental results were found to agree sufficiently well both quantitatively and qualitatively with the theoretical deduction. The only failure was for small moisture values, where the experimental results did not indicate any rise in cohesion. The most important general inference made was that the attainment of high values of capillary cohesion in a soil depends upon a small value for the size of the particles. For any given particle size the cohesion has the same order of magnitude at all moisture contents. The predominating influence is the soil texture, i. e., it is the number of water films present which matters rather than their radius of curvature as such.

The conclusion is drawn that the value of the internal friction of a soil falls with increasing fineness of the particles. The effect would appear to be strictly analogous to the decrease in friction between two surfaces when the rugosities on them are decreased in size by polishing.

III. *Observations on the electrical conductivity of soils* (pp. 536–543).—An improved and simplified laboratory method of measuring the electrical conductivity of soils is described, and measurements are recorded for different soil samples.

The results for ignited soil lead to certain confirmations of the capillary theory of an ideal soil. The results for soils generally indicate a sufficiently simple connection between conductivity and moisture for this property to be made the basis of soil moisture determinations. Certain clays were found to form a class apart, and must be regarded as exceptions to the general statement above, owing to the more complex nature of the moisture-conductivity relationship.

Soil tillage for spring seeding [trans. title], W. NITZSCH (*Technik Landw.*, *6* (*1925*), *No. 10, pp. 236–239, figs. 2*).—Tests of different methods and machines for spring seed bed preparation are briefly reported.

Scarified soil was found to retain winter moisture better than plowed soil. Seed drills with ordinary drill shares were found to work irregularly in very loose soil, and the seed did not have the correct contact with the soil particles. Rolling of scarified soil resulted in a better structure in this connection. Rolling of seeded rows resulted in a more dense soil structure and a better contact of the seed with the soil. Such treatment also resulted in a higher water retaining capacity of the row soil than of that between the rows.

The degree of action of wind power machines [trans. title], E. MOELLER (*Technik Landw.*, *6* (*1925*), *No. 10, pp. 239–243, figs. 4*).—A mathematical analysis of wind power machines is presented together with actual test data, indicating that the maximum useful wind velocity lies close to 10 meters per second (22.4 miles per hour).

Present status of rural electrification in Kansas, H. B. WALKER (*Kans. Engin. Expt. Sta. Bul. 16* (*1925*), *pp. 47, figs. 24*).—A study made by the Kansas Experiment Station in cooperation with the Engineering Experiment Station of the Kansas State Agricultural College to determine the character, kind, and extent of rural electrical service on Kansas farms from central power stations, and a study of types of farming in connection with services rendered, uses of energy for each type, amount of energy used, transmission problems, etc., are reported.

The results showed that the greatest appreciation of electric service by Kansas farmers is for illumination, and it is concluded that farm illumination outside of the home is a logical line of study. Illumination for poultry production, while found of value in special instances, was frequently considered impractical by the farmer. The conclusion is drawn that the use of electric incubators will be limited largely to commercial hatcheries, while the brooding of chicks on the farm will increase with the development of commercial hatcheries. Thus the electric brooder will have a wider demand for farm use than the electric incubator.

Sixty per cent of the farms of the State were found to use ice, and the development of a practical, reliable, and economical electric refrigerator for rural use is considered to be another logical line for investigation. The use of electricity for pumping, while an established service, was found to offer greater promise for building up a rural electrical load than any other single service. Grain grinding, elevating, shelling, and cleaning were found to offer the best field of general farm development in motor belt work, while silage cutting and threshing if generally motorized must compete with the tractor.

Possibilities for a general utility motor were indicated, but the use of electric motors for drawbar work is considered to be as yet wholly within the experimental field. Electric milking machines were also found to be in the developmental stage, particularly for the smaller dairy farms.

The average farm user of electrical energy was found to use but little, if any, more current than the urban user, and line and transformer losses on

many rural lines exceeded the amount of current used. It is stated that the volume of energy used is more important on rural transmission lines than the number of users.

Dairying as a type of farming is considered to be the most susceptible to electrification, and livestock farming also offers promise of providing a fairly good demand for volume of electrical energy. It is concluded that the use of electricity in grain farming areas will be limited largely to household uses, but that diversification will tend to improve electrification possibilities with this type of farming.

Two appendixes, one by G. S. Knapp on the use of electricity for irrigation pumping and the other by W. E. Grimes on Kansas agricultural tendencies, are included.

How farmers can secure electric service by cooperative effort, G. H. MORSE (*Penn. Dept. Agr. Bul. 412* (*1925*), *pp. 22, figs. 4*).—A plan to secure electricity for farmers of Pennsylvania by cooperative effort is outlined in some detail.

The gripping action in motor plow tests [trans. title], MARTINY (*Technik Landw., 5* (*1924*), *No. 10, pp. 197–199, figs. 9*).—Tests of the efficiency of the drivewheel equipment of six agricultural tractor cultivators on heavy sticky soil are reported.

The results indicated that the proper design of drivewheel equipment, and especially of the lugs of agricultural tractors, is dependent chiefly upon the soil conditions. On the heavy sticky stubble soil, cross lugs gave better results than spiral lugs. Narrow slots in the wheel rim were useless, and wide slots assured traction but with a great waste of power. Side extensions of lugs gave good results, but broad wheel rims with small lugs were almost as satisfactory.

[**Tests of equipment for the production of potatoes**], A. CHRISTENSEN ET AL. (*Statens Redsk. Prøver* [*Denmark*] *Beret., 37* (*1925*), *pp. 142, figs. 41*).—Tests of equipment for the planting, cultivation, digging, sorting, and storage of potatoes are reported in considerable detail.

Logging machinery used on the Pacific coast, W. C. SHAW (*Mech. Engin.* [*New York*], *47* (*1925*), *No. 11, pp. 913, 914, fig. 1*).—A brief description of some of the important mechanical details of logging machinery used on the Pacific coast is presented, together with line-pull and speed curves for a 13 in. by 13 in. simple geared, 2-speed yarder.

Lubricants and lubrication, J. DUGUID (*Mech. Engin.* [*New York*], *47* (*1925*), *No. 11, pp. 887–894*).—A large amount of data on the subject is presented in condensed form, from which specifications for a really efficient lubricant for different types of machinery are derived.

It is concluded that a lubricant must be of sufficient body to keep the bearing surfaces apart at working temperatures, and must possess qualities that will reduce friction to a minimum. It must remain fluid at the lowest temperatures that are encountered under ordinary service conditions, and must meet service requirements as to durability, resistance to elements, usage, etc. It must contain no impurities which will corrode or pit the bearing surfaces, must have no tendency to decompose or form deposits, and must be of sufficient capillarity to feed evenly and successfully, with little change in this respect when encountering natural changes in atmospheric temperatures.

A basis for research in the development of lubricants and lubricating systems for machinery is thus presented.

Investigations of small refrigerating apparatus [trans. title], W. REDENBACHER (*Technik Landw., 5* (*1924*), *No. 10, pp. 202, 203, figs. 3*).—Investigations of the efficiency of small refrigerating apparatus, especially for dairy purposes,

are briefly reported. It was found useful to mount the motor, the compressor, and the refrigerator as a unit and to transmit power through housed gears to prevent the entrance of moisture. The importance of constructing the refrigerator proper of waterproof insulating materials was also indicated. It was found that the entrance of moisture not only destroyed the insulating materials and the wood, but also reduced the insulating action.

The heating effect of radiators, C. W. BRABBÉE (*Jour. Amer. Soc. Heating and Ventilating Engin., 31 (1925), No. 11, pp. 501–520, figs. 14*).—A practical method for testing radiators by comparison is presented in some detail, which is considered not only desirable but essential for correct design and judgment. It is pointed out that a definite amount of heat properly distributed at knee height is required in rooms rather than a certain number of square feet of iron surface. It is concluded that the installation of radiators on the basis of their effective B. t. u. output, as determined by the test method, should result in the most economical and hygienic application of their heating effect.

The Gothic roof, F. E. FOGLE (*Michigan Sta. Quart. Bul., 8 (1925), No. 2, pp. 71–76, figs. 7*).—A description of the use of the Gothic roof in barn construction is given, including diagrammatic illustrations.

Studies on the biology of sewage disposal: The fauna of Imhoff tanks, J. B. LACKEY (*New Jersey Stas. Bul. 417 (1925), pp. 3–39, figs. 84*).—Studies are reported in part 1 which showed that all three classes of protozoa are represented in the fauna of the Imhoff tanks under investigation. Rhizopods were found to be fewest in genera and numbers and flagellates the most numerous. About 70 species of protozoa were encountered with some frequency, the common forms being either facultative or obligatory anaerobes. Some of the protozoa were found to come into the tanks in the free living state, and some in the encysted form. Not all of those carried in live, and some of the encysted forms do not excyst.

In part 2 the protozoa which were found are described.

RURAL ECONOMICS AND SOCIOLOGY

Economic studies of dairy farming in New York.—IV, Grade B milk with cash crops and mixed hay roughage, crop year 1921, E. G. MISNER (*New York Cornell Sta. Bul. 441, (1925) pp. 3–76, figs. 3*).—This bulletin is the fourth of a series of reports on the organization and dairy enterprise costs on different types of dairy farms in New York State, an earlier one of which was noted (E. S. R., 53, p. 391). It is concerned with results obtained from 121 farms in northern Chenango and southern Madison Counties for the year ended April 30, 1922.

The total receipts on these farms average $5,082 and the total expenses $3,932. Interest at 5 per cent on the average capital per farm of $16,586 was deducted from the difference, leaving $321 as the average labor income of the 121 operators. The average cash living costs of operators' families were $379 for food, $196 for clothing, and $241 for other expenses, making a total of $816 per farm, or $68 per month. When the net income is expressed in terms of interest on the investment by deducting from the farm income the value of the operator's time, slightly less than 1 per cent return on the capital is indicated.

The net cow cost of producing milk was $2.56 per 100 pounds, the herd cost $2.63, and the cost per pound of butterfat 76 cents. An average loss of $26.70 per cow in addition to an average decrease in the market value of cows of $20.42 per head for grades and $27.86 for purebreds is shown. The

loss per 100 pounds of milk sold was 46 cents. The returns per hour of labor above all other costs in the production of milk on these farms was 9.3 cents. The total income per cow was $150.41, and the costs $177.11.

The cost of raising heifers is tabulated and discussed, and the proportion of cows freshening from September to December, inclusive, is indicated.

The business of these farms was organized on a system in which 81 per cent of the cows were purebred. Certain cultivated cash crops were grown, and of the sales of these 47.4 per cent was from cabbage, 30.3 per cent from market peas, 8.4 per cent from potatoes, and 5.2 per cent from hay. Details are given as to the expenses of producing and marketing these crops, as well as of the use of fertilizer and the distribution of labor. A tabulated summary is given for comparing individual farms with the average, and important business factors are shown for all farms, arranged according to size. Business data from four successful farms are discussed.

Economic studies of dairy farming in New York.—V, Cheese-factory milk, E. G. MISNER (*New York Cornell Sta. Bul. 442 (1925), pp. 50, fig. 1*).—Another of the series noted above and presenting the data on a plan similar to it, this bulletin reports upon the production of milk for factories making Limburger and whole-milk Cheddar cheese in Jefferson County. Except in some years, when hay was sold as a cash crop, the dairy was the exclusive source of income on the 67 farms studied.

The average size of farm was 203 acres, the average total capital $13,909. The total receipts per farm for the year ended April 30, 1922, were $2,002, and the current operating expenses $1,513. Subtracting interest at 5 per cent on the capital, an average labor income of minus $374 is left. The net cow cost of producing all milk was $2.14 per 100 pounds and the herd cost $2.23. The average return per 100 pounds of milk was $1.63, excluding the returns from calves and calf hides and manure. After all charges except those for labor were met, the returns in milk production were 2 cents per hour for all time spent on the enterprise.

A plan of farm organization for hill land farms in southeastern Ohio, E. J. UTZ, S. C. HARTMAN, and H. W. HAWTHORNE (*Ohio Agr. Col. Ext. Bul., 12 (1925), No. 1, pp. 20, figs. 14*).—An outline is presented for the organization of one-man farms. The importance of volume and quality of the business is illustrated with selected farm-management data representative of this section.

Suggestions for better farming in the Seaford community, H. W. HAWTHORNE and M. O. PENCE (*Del. Univ. Agr. Ext. Bul. 10 (1925), pp. 40, figs. 10*).—A farm business survey of 91 farms was carried out in Seaford community in southeastern Delaware for the year 1923. On the basis of this survey a plan of organization and management is drawn up here, giving consideration to the commercial truck crops and feed crops to be grown; the poultry, work animals, and hogs and cattle to be maintained; and the family living to be expected from the farm.

Dairy farming on mass production lines (*Jour. Min. Agr. [Gt. Brit.], 32 (1925), No. 8, pp. 726–728*).—A scheme of dairying followed on a farm in Wiltshire, England, comprising 1,800 acres, all in grass pasture, is described. Low-grade heifers are bought, milked a short time, and sent to market with the second calf. By this system an average of between 600 and 800 head of stock are kept. The buildings, equipment, and water supply are briefly described.

History of Australian land settlement (1788–1920), S. H. ROBERTS (*Melbourne: Macmillan & Co. and Melbourne Univ. Press, 1924, pp. XX+427, [pls. 35]*).—This is a detailed historical treatment of Australian land policy.

The tenure of agricultural land, C. S. ORWIN and W. R. PEEL (*Cambridge: Univ. Press, 1925, pp. IX+76*).—Numerous proposals for the reconstruction of rural land tenure in England are set forth from the point of view of their historical interest. The new scheme proposed by the authors provides for State purchase, and the details of valuation and administration are presented.

Costs of producing sugar beets.—Part I, Michigan, T. O. MARVIN, E. B. BROSSARD, ET AL. (*Washington: U. S. Tariff Comn., 1925, pp. VII+96, figs. 16*).—This is part 1 of a report on an investigation of the costs of production of sugar beets. The field investigation was begun on September 4, 1923. Detailed costs were obtained for the 1922 production in 22 selected areas covering 2,242 farms in Michigan, Ohio, Nebraska, Colorado, Utah, Idaho, Wyoming, Montana, and California. In Michigan data were obtained for 476 farms in 5 representative areas which centered about the towns of Alma, Bay City, Caro, Owosso, and Sebewaing. The details of the 1921 and 1923 costs were determined by applying to the quantities of labor, horse hours, seed, and other material employed in the production of an acre of sugar beets in 1922 the respective 1921 and 1923 costs per unit of each quantity. Tables and charts constitute the main body of the report. The appendix gives a copy of the form of schedule used.

Agricultural costs of production and profits in France, M. LAIR (*Rev. Écon. Internatl., 17 (1925), III, No. 2-3, pp. 290-312*).—This article presents a general discussion of the relative position of agriculture and industry in France, difficulties in calculating agricultural costs of production, expenditures and receipts, prices of agricultural products and inflation, and other related topics. The predominance of the family type of self-sufficing agriculture is pointed out

The agricultural bookkeeping offices in the different countries, J. M. SAULNIER (*Les Offices de Comptabilité Agricole dans les Divers Pays. Rome: Inst. Internatl. Agr., Bur. Renseig. Agr. et Malad. Plantes, 1924, pp. XX+509, figs. 4*).—This monograph presents a summary of the investigation under the auspices of the International Institute of Agriculture of the extent to which agricultural bookkeeping is fostered and encouraged as a phase of Government statistical investigations. Part 1 consists of five chapters setting forth the origin, objects, and the importance of Government offices of agricultural bookkeeping. Part 2 describes the activities in this respect of specific countries.

A study of 81 principal American markets, L. M. BARTON (*Chicago: The 100,000 Group of Amer. Cities, 1925, pp. XII+346, pls. 2, figs. 139*).—Data are assembled pertaining to the characteristics of population and business in their relation to each other in cities with a population of 100,000 or more and the towns of 1,000 or more within a defined trading radius of them. The information has been taken largely from the 1920 census.

The farmer and the United States Warehouse Act, H. S. YOHE (*U. S. Dept. Agr., Misc. Circ. 51 (1926), pp. 14, figs. 4*).—The way in which this law functions the provisions for supervision of warehouses after licensing, and the benefits the farmer may expect to receive from Federally licensed warehouses are briefly discussed. Forms of receipts are shown, and some expressions of the attitude of bankers with reference to them are cited. The two requirements that no receipt shall be issued until the product for which it is issued is actually placed in storage in the licensed warehouse and that no products shall be delivered from storage until the receipt is actually surrendered to the warehouseman are noted particularly as essential to the effectiveness of the law.

Refrigeration and cold storage: A selected list of references . . ., compiled by L. O. Bercaw (*U. S. Dept. Agr., Library, Bibliog. Contrib. 10 (1925), pp. IV+58*).—This is a mimeographed selected list of references covering the years 1915–1924 and the early part of 1925.

Forecasting the price of hogs, C. F. Sarle (*Amer. Econ. Rev., 15 (1925), No. 3, Sup. 2, pp. [2]+22, figs. 5*).—This is an essay awarded the Babson prize by the American Economic Association. The 10 years from 1897 to 1916 are taken as the base period for the study. The four factors used as a basis for predicting future hog prices are correlated with Chicago heavy hog prices as follows: (1) The price of industrial stocks, 6 months' lag with a positive correlation of 0.42, (2) the Chicago price of No. 2, mixed corn, 12 months' moving total, 5 months' lag, positive correlation of 0.57, (3) the corn-hog ratio between the 12 months' moving total of Chicago corn and heavy hog prices, 12 months' lag, negative correlation of 0.39, and (4) the Chicago heavy hog prices, 6 months' moving total, 3 months' lag, with a positive correlation of 0.71. Tabulations and charts compare the prices of industrial stocks and hog prices, corn and hog prices, and actual and predicted hog prices.

Report of the Agricultural Enquiry Committee [of the Province of Ontario], 1924 (*Toronto: Prov. Govt., 1925, pp. 93*).—A committee of the Legislative Assembly of Ontario, appointed to inquire into the social, educational, and economic conditions surrounding the agricultural, livestock, and dairying industries of the Province, presents its report, which is largely a review of resources and a study of problems associated with marketing, education, immigration and farm labor, the farm home, roads, reforestation, fur farming, the development of remote sections, and the relation of agriculture to other interests.

Economic resources of Canada, H. Rew (*[Gt. Brit.] Min. Agr. and Fisheries, Econ. Ser. 3 (1925), pp. 128*).—This report is one of the series previously noted (E. S. R., 54, p. 484). It describes the factors which may be expected to contribute to economic and agricultural development in Canada.

The land and the nation (*London: Hodder & Stoughton, 1925, pp. VI+584*).—This is the rural report of the Liberal Land Committee in Great Britain for 1923–1925. It is made up of four parts, the first outlining the rural life problem, the second presenting statistics and various data related to costs of agricultural production, the third dealing with difficulties of land tenure, and the fourth setting forth the policy which this committee supports, involving repossession by the State of all land in the United Kingdom used or capable of use in agricultural production or for timber or other natural products.

Agriculture [in Wales], L. B. Cundall and T. Landman (In *Wales: An Economic Geography. London: George Routledge & Sons, 1925, pp. 74–100, figs. 7*).—This chapter from an economic geography of Wales gives a descriptive account illustrated with dot maps showing the distribution of agriculture and livestock.

The agriculture of Le Mellois, L. Roy (*Le Mellois Agricole. Thesis, École Agr., Niort, 1924, pp. 104, pl. 1*).—This study is descriptive of the agriculture and the livestock industries characteristic of a region in the Department of Deux-Sèvres in France.

The agricultural situation [trans. title], (*Deut. Landw. Rat. Veröffentl. 4 (1925), pp. 96, figs. 68*).—A review of the economic situation of German agriculture is presented here under the following heads: German agriculture at the beginning of 1924, business relationships and returns in agriculture, livestock and the supply of livestock products, the spread between growers' and retailers' prices of the important agricultural products, the credit supply for

agriculture, the tax burden in 1924, the position of agriculture with reference to trade policy, railway tariffs, social insurance, and means of adjustment to agricultural needs.

Agricultural laws [of Northern Ireland] (*North. Ireland Min. Agr. Ann. Rpt., 3 (1923–24), pp. 57–72*).—The provisions contained in acts passed in recent years dealing with agriculture are outlined.

Control of output in agriculture, C. F. CLAYTON (*Michigan Sta. Quart. Bul., 8 (1925), No. 2, pp. 87–89*).—The three main methods of controlling output by the restriction of acreage by agreement, signing up the entire acreage, and supplying information as to conditions of demand and supply are discussed here. The ways in which the problems of farmers differ from those of business men in respect to the control of output are set forth.

Co-operative agriculture, E. A. LLOYD (In *The Co-operative Movement in Italy. London: Fabian Soc., 1925, pp. 79–96*).—This chapter from a study of the cooperative movement in Italy traces briefly the origin and development of the system of collective leases. The example is cited of the work of societies of the Province of Ravenna, and extracts are given from a report which summarizes the activities up to the end of 1921 of a federation interested in the organization and development of cooperative enterprises.

The place of co-operation among other social movements, V. TOTOMIANZ (*Manchester, Eng.: Coop. Union (Ltd.), 1923, pp. 48*).—This is a short discussion of the theory and principles of cooperation, pointing out their application to agriculture, as well as to other industries.

Co-operation in the blue-grass, H. A. BARTH (*Jour. Polit. Econ., 33 (1925), No. 4, pp. 455–465*).—This paper outlines the organization plan of the Burley Tobacco Growers' Cooperative Association, its methods of acquiring warehouses, and its operations in recent years. Its experience so far shows that an attempt to keep the price of the product above the cost of production while disregarding the necessity for curtailing supply or increasing demand will fail, that there are certain economies in joint selling, and that it is possible to organize farmers into selling agreements.

Interdependence of town and country, E. GLANVILLE (*So. African Jour. Indus., 8 (1925), No. 8, pp. 482–488*).—The author holds that closer business relations are needed, particularly with respect to credit and various financial transactions, marketing facilities, and highway improvement.

A pageant of agriculture, H. H. HUDSON and M. E. DUTHIE (*N. Y. Agr. Col. (Cornell) Ext. Bul. 123 (1925), pp. 23, figs. 5*).—A pageant has been arranged in four brief episodes and three interludes representing the progress of agriculture and rural life, especially as exemplified in New York State. The thought underlying the use of the allegorical figures is that agriculture has been attended by labor, while invention, education, and cooperation have contributed to development.

Index numbers of production, wages, and prices, J. I. FALCONER (*Ohio Sta. Bimo. Bul., 11 (1926), No. 1, pp. 38, 39*).—The tabulation of index numbers previously noted (E. S. R., 54, p. 389) is continued to include data for later months.

Agricultural statistics of the State of Colorado, 1924 (*Denver: State Bd. Immigr., 1925, pp. 48, figs. 21*).—The cooperative crop reporting service adds the later statistical report continuing the series previously noted (E. S. R., 51, p. 94).

Agricultural statistics of Algeria (*Statistique Agricole de l'Algérie. Algiers: Gouvt. Gén. Algérie, Dir. Agr., Com. et Colon., Serv. Statis. Gén., 1925, pp. VII+63, pls. 60*).—Agricultural statistics for the years 1916 to 1923, inclusive, with comparisons for earlier years are presented.

AGRICULTURAL AND HOME ECONOMICS EDUCATION

Ninth annual report to Congress of the Federal Board for Vocational Education, 1925 (*Fed. Bd. Vocat. Ed. Ann. Rpt., 9 (1925), pp. XIII+180, figs. 21*).—This annual report presents the general résumé of the work of the board for the current year and the following special reports:

Home economics education service (pp. 50–76).—The expenditures and enrollment in vocational home economics education from 1918 to 1925 are presented graphically, and the development of the vocational program from 1917 to 1924 is discussed. The increase in the use of the home project, improvements in facilities for teacher training, and the provision of home management houses as laboratories, instruction in child care, and vocational classes for negroes are noted for this period and for the year 1925.

Research work has consisted largely in the investigation of methods and surveys of the needs and opportunities in this field. Certain bulletins have been prepared for use as teaching material. Vocational analyses and studies of plant and equipment, as well as special studies on work for negroes, are cited, and a detailed description is given of the plans and accomplishments to date for general studies by members of the staff of the home economics education service. These include responsibilities and difficulties of the day school of the home economics teacher, adequate vocational experience of teachers, teacher training for negro vocational schools, locating the difficulties of trades women in teaching adult classes in home economics, related subjects in the day vocational school, and home economics in the part-time school. Social service aspects of the vocational program are pointed out.

Agricultural education service (pp. 110–180).—The enrollment and development in Federally aided agricultural schools, 1918 to 1925, are graphically presented, and the aims and purposes of regional, sectional, individual, State, and district conferences participated in are set forth, together with the cooperation with various boards and educational bodies. Several independent, as well as cooperative, investigations, including job analyses, compilation of statistical information, and correlations, are described briefly. A summary of progress for the year ended June 30, 1925, together with the statistical tables, concludes the report.

Land-grant college education, 1910–1920, V, edited by W. C. John (*U. S. Bur. Ed. Bul. 29 (1925), pp. IV+91, pls. 8*).—This report, dealing with home economics education, completes the study, parts of which have been noted (E. S. R., 53, p. 494).

Farm colonies in Italy for the orphans of peasants killed in the war, G. Costanzo (*Internatl. Rev. Agr. Econ. [Rome], n. ser., 3 (1925), No. 3, pp. 479–498, pls. 4*).—This paper gives a short account of organizations, particularly of a national institution for giving assistance to the war orphans, responsible for the establishment and support of this movement. Brief notes are given on the 15 principal farm colonies, setting forth the equipment for providing training in farm practices and the methods employed.

Productive plant husbandry, K. C. Davis (*Philadelphia and London: J. B. Lippincott Co., 1925, 3. ed., rev., pp. XVI+462, pl. 1, figs. 312*).—This, the third edition (E. S. R., 37, p. 795), deals primarily with subject matter for high school instruction.

Cycles of garden life and plant life, F. C. Fox (*U. S. Bur. Ed. Bul. 15 (1925), pp. VII+98, pl. 1, figs. 41*).—A series of projects in nature study for elementary schools has been presented in this publication. The material is presented in two separate units for lower and upper grade work.

FOODS—HUMAN NUTRITION

Discussion on food manipulation in relation to health (*Brit. Med. Jour.*, *No. 3378 (1925), pp. 560–564*).—In the opening paper of this symposium, held by the section of public medicine of the British Medical Association at its 1925 meeting at Bath, W. G. Savage outlined the various forms of manipulation of food as manipulation to preserve perishable foods, such as cold storage, canning, drying, and the addition of preservatives; to make the finished article more digestible and palatable, as in simple cooking, manufacture of white flour, polishing of rice, etc.; to provide a new type of food, as in the making of butter, cheese, etc.; food sophistication and adulteration; and accidental contamination. As regards the effect on health conditions, these practices may be grouped under three heads—the effect of manipulative changes upon the nutritional properties of food, bacterial and parasitic infections, and chemical contaminations.

Under the first head the question of the effect of manipulation upon the vitamin content of foods and the practical dangers resulting from vitamin deficiencies were considered briefly, with the conclusion that the relationship of general ill health in a community to vitamin deficiency has not been sufficiently demonstrated to warrant its being used as a basis for a public-health campaign. The subject of bacterial contamination was discussed in considerable detail, largely from the author's studies on the subject which have been noted from various sources.

The second paper by C. E. Goddard on accidental contamination of food dealt with food pollution through unnecessary handling and exposure. The two papers were followed by a general discussion reported in abstract.

The penetration of fruits and vegetables by bacteria and other particulate matter, and the resistance of bacteria, protozoan cysts, and helminth ova to common disinfection methods, R. G. MILLS, C. L. BARTLETT, and J. F. KESSEL (*Amer. Jour. Hyg., 5 (1925), No. 5, pp. 559–579*).—This investigation, which was reported from the department of pathology, Peking Union Medical College, Peking, China, was occasioned by the prevalent practice in the Orient of fertilizing the soil in which vegetables and fruits are grown with human excreta and of freshening cut vegetables and fruits with water which may be highly contaminated.

The first point studied was whether the methods commonly employed by foreigners in the Orient of disinfecting fruits and vegetables to be eaten raw by washing in chlorinated water, potassium permanganate solution, alcohol, or boiling water are effective in killing protozoan cysts and helminth ova. The possibility of such contamination penetrating into the cut ends of vegetables or the stem ends of fruit was tested by alternately wilting and freshening a series of vegetables and fruits by immersion in a suspension of ground lampblack in aqueous eosin solution. Although the dye penetrated to the tips of the leaves of all the fresh vegetables and to a slight extent into some of the fruits, particularly in bruised and decayed spots, the carbon did not penetrate beyond bruised or crushed surfaces. It is concluded that matter corresponding in size to various forms of bacteria, protozoan cysts, and helminth ova will not penetrate into vegetables and fruits beyond the parts ordinarily removed in preparation for table use.

Several fruits and vegetables from the market were then examined for sterility of the interior structures and were all found to be sterile. Fruits first sterilized in chlorine water and then immersed in broth containing *Bacillus coli* were found to have viable organisms on their surface after exposure for at least 15 days under dry or moist conditions. The bruised

areas of fruits and the cut ends of vegetables after similar exposure contained viable organisms, but the main portions remained sterile. Attempts to sterilize fruit contaminated in this way were successful in the case of chlorine water, 10 parts per million for 15 minutes, and boiling water for from 10 to 20 seconds, and were partially successful in the case of soap and water and chlorine water, 3 to 6 parts per million.

The third part of the investigation, which was conducted by J. F. Kessel, consisted of a study of the resistance to various disinfecting agents of protozoan cysts and helminth ova on the surface of fresh fruits. The only reliable method appeared to be dipping the fruits and vegetables for 10 seconds into sufficient boiling water so that the temperature remains above 80° C. during the immersion.

A bibliography of 57 titles is appended.

An epidemic of scarlet fever spread by ice cream, G. H. Ramsey (*Amer. Jour. Hyg., 5 (1925), No. 5, pp. 669–681, figs. 3*).—This epidemic, totaling 116 cases at Flint, Mich., and 12 in nearby villages, with three fatalities, was traced to an ice cream maker who was under quarantine for scarlet fever and had made ice cream for three days after the onset of the disease.

On the composition of soy bean, S. Muramatsu (*Bul. Imp. Col. Agr. and Forestry, Japan, No. 7 (1924), pp. [2]+52, pls. 2, fig. 1*).—This bulletin reports miscellaneous studies on soy beans, including the separation and analysis of the proteins; the determination, isolation, and properties of the starch; the identification of a soap; and the preparation and composition of Tofu, a food material made from the soy bean.

A study of north China dietaries, W. H. Adolph (*Jour. Home Econ., 17 (1925), No. 1, pp. 1–7*).—The data upon which is based this report of the dietary customs of the average middle-class family in north China include 30 reports covering the diets of 340 adults and 114 children below 12 years of age, corresponding to a total of 19,777 adult unit days. The reports were made by students familiar with quantitative methods and with the purpose of the investigation. In general the data were secured on the raw materials purchased. As there was very little waste, this was comparable with the records of the amounts eaten at each meal. From these reports tables were prepared showing the kinds and quantities of the various foodstuffs in these dietaries, the amounts and proportions supplied by the different classes of foodstuffs, the average weight of protein and amounts of energy supplied per capita per day, and the average proportionate distribution of food expenditure among the various food groups. The more important data are summarized in the following table:

Distribution of food in 30 north China dietaries

Kind of food	Percentage of total		Distribution of calories			
	Weight	Cost	Protein	Fat	Carbohydrate	Total
	Per cent	*Per cent*	*Calories*	*Calories*	*Calories*	*Calories*
Bread, cereals, beans	66.0	75.0	277.6	97.8	1,895.4	2,270.8
Fruit and vegetables	28.0	10.0	14.7	0.0	64.4	79.1
Meat and fish	2.0	7.0	18.9	33.3	0.0	52.2
Butter, fats, sugar	1.0	3.0	0.0	58.2	10.8	69.0
Eggs	0.8	3.0	(1)	(1)	(1)	(1)
Milk	0.1	0.1	(1)	(1)	(1)	(1)
Other foods	2.1	2.0				
Total	100.0	100.1	311.2	189.3	1,970.6	2,471.1

[1] Included with meat and fish.

The diets as a whole are considered to be adequate but not optimum as regards calories, probably adequate as regards vitamins, although it is thought that more milk should be included, and adequate as to proteins, although including less of animal protein than other Oriental diets in which rice is the only cereal. "The exact effect on a people of a diet in which, as in that of north China, the protein is largely of vegetable rather than of animal origin, is not known. For that are needed more studies of metabolism in the Orient, more data on the utilization by the human body of the bulky cereal diets of the Far East, more investigation of the amount of inorganic constituents, especially calcium and phosphorus in those diets, more information as to the energy requirements of Chinese men and women of various occupations."

Growth of Chinese, V. B. APPLETON (*Amer. Jour. Diseases Children, 30 (1925), No. 1, pp. 43–49*).—Anthropometric measurements, taken in all cases by the author, are reported for 224 Chinese girls from 6 to 22 years of age who were students in boarding schools in two cities in the Chekiang Province, east China. From these absolute measurements relative measurements have been calculated and tabulated for the cephalic index and the weight-height, weight-sitting-height, arm-height, leg-height, and trunk-height indexes. A classification of the general nutritional condition of the subjects from examination of the subcutaneous fat, bones, and muscles is also reported. Of the age groups under 13 years, only two showed less than 50 per cent of poorly nourished children. These were the 8-year-old group (42 per cent) and the 10-year-old group (47 per cent). The primary defect appeared to be poor bone development of the chest.

Clinical dietetics of infancy.—Buttermilk: Food and medicine [trans. title], E. CHASSERAY (*Rev. Prat. Malad. Pays Chauds. 4 (1925), No. 9, pp. 1241–1270*).—This general discussion of the use of buttermilk in infant feeding in the Tropics, particularly in cases of digestive troubles, includes methods for the manufacture of buttermilk and the preparation of buttermilk soup or porridge, its physical and chemical characteristics, nutritive value alone or in combination, and indications for its use in infant feedng.

Studies of the metabolism of women.—I, Variations in the fasting blood sugar level and in sugar tolerance in relation to the menstrual cycle, R. OKEY and E. I. ROBB (*Jour. Biol. Chem., 65 (1925), No. 1, pp. 165–168, figs. 3*).—In this investiagtion of the possible variations in the fasting blood sugar levels and in the response to the ingestion of a given amount of glucose in women at different phases of the monthly cycle, data obtained on two groups of subjects are reported. Group 1 consisted of 3 college women students who were on weigbed, analyzed diets in connection with a detailed study of nitrogen metabolism and group 2 of a larger number of women students who were on ordinary diet. The blood samples in the first group were taken directly after basal metabolism determinations and in the other group at about the same time but without a preliminary resting period.

In all 315 determinations of blood sugar covering 49 menstrual periods in 26 subjects were made. The most significant point brought out by an examination of the data thus obtained is the greater susceptibility to fluctuations in the blood sugar during menstruation. Although the average menstrual value was slightly higher than the intermenstrual, there was a greater number of low as well as of high individual values during the former period. The advisability is suggested on this account of avoiding this period as far as possible in making single determinations of blood sugar for clinical diagnosis.

The sugar tolerance tests were conducted on 10 subjects and consisted in the administration without a previous meal of glucose in 50 per cent solution in doses of 1.75 gm. per kilogram body weight, and the subsequent determination

of blood sugar and hemoglobin at one-half hour intervals for 2 hours and of urinary sugar at the end of the first and second hours. In all of the cases observed there were smaller initial increases in the blood sugar and a greater degree of secondary hypoglycemia during the menstrual period than at any other time. This is thought to suggest the possibility of a lowered functioning of the pancreas coincident with the time of menstruation. "Speculation as to whether or not this is the result of an altered ovarian or suprarenal secretion seems hardly justified by the evidence at hand."

The relation of histidine and arginine to creatine and purine metabolism, W. C. Rose and K. G. Cook (*Jour. Biol. Chem., 64 (1925), No. 2, pp. 325–338*).—The question of the interchangeability of histidine and arginine in the diet, previously answered in the negative as regards growth (E. S. R., 52, p. 859), has been studied with reference to the excretion of allantoin, uric acid, and total creatinine to determine whether these acids are interchangeable with respect to creatine and purine metabolism. The method of procedure was essentially the same as in the previous study.

Diets in which the nitrogen was furnished by whole casein or completely hydrolyzed casein led to the excretion of increasing amounts of total creatinine, allantoin, and uric acid, which were roughly proportional to the increments in body weight. On diets in which the nitrogen was furnished by hydrolyzed casein from which the histidine and arginine had been precipitated there was a decrease of from 40 to 50 per cent in the output of allantoin, a slight decrease in the excretion of uric acid, and an increase followed by a decrease in total creatinine. On a diet adequate except for tryptophane the animals lost in weight, but there was no change in the output of allantoin and uric acid. The addition of histidine to the diet containing hydrolyzed casein from which histidine and arginine had been removed led to increases in the excretion of creatinine, uric acid, and allantoin until the amounts excreted were of the same order as in animals upon whole casein. A similar addition of arginine was without effect. This is thought to indicate that arginine and histidine are not interchangeable in purine metabolism, and also that histidine is one of the precursors of purines.

The calcium content of the body in relation to age, growth, and food, H. C. Sherman and F. L. MacLeod (*Jour. Biol. Chem., 64 (1925), No. 2, pp. 429–459, figs. 6*).—In this extensive investigation of the calcium content of the body at different ages and under different dietary conditions, white rats were used as the experimental animals, and the calcium determinations were made by the McCrudden gravimetric method upon the ashed bodies of the entire animals minus the alimentary tract.

The first series of studies were made upon normal rats which had been raised on a diet consisting essentially of a dry food mixture of one-third whole milk powder and two-thirds ground whole wheat or in a few cases white flour. This diet has been used in many other studies reported from the same laboratory and has served without other supplements for the normal nutrition of 15 successive generations of rats. Rats were taken for analysis at birth and at 15, 30, 60, 90, and 120 days of age. From 15 days up the sexes were determined, and each animal was analyzed separately and the averages calculated for the different sexes, using from 5 to 13 animals of each sex. The average values for calcium thus obtained in percentages of the maximum body weight attained were at birth 0.25 per cent; 15 days, male 0.58 and female 0.6; 30 days, 0.69 and 0.74; 60 days, 0.76 and 0.86; 90 days, 0.93 and 1.09 per cent, respectively, and at 120 days, males 1.01, females which had borne no young 1.07, and females which had raised 1 litter 0.98 per cent. Beyond this time analyses were not made at such frequent intervals, but the following average data

are reported: Adult male rats, average age 188 days, 1.05, and 243 days, 1.06 per cent; adult female rats which had raised no young, 189 days, 1.12 per cent, 243 days, 1.19, and 266 days, 1.28 per cent; and adult females which had raised young, 244 days, 1.05, and 261 days, 1.01 per cent.

A comparison of these figures shows a rapid increase in the percentage of calcium up to about 90 days and after that a slower increase. In the female rats there was at first a distinct loss in the percentage of calcium as the result of bearing and suckling the young, after which there was an approximate balance between the tendency to lose calcium during lactation and to regain it during intervening periods.

In the study of the effect of deficient diets on the calcium content of the body, diets lacking, respectively, in fat-soluble vitamin, vitamin B, protein (cystine, the first limiting factor), and calcium were used. In all cases in which the supply of calcium was ample but growth was stunted because of other deficiencies, the calcium content was higher than that of normal rats of the same weight but lower than that of normal rats of the same age. Animals placed on the low calcium diet at weaning or later in life lost calcium to such an extent that the percentage was below normal for weight, as well as for age. Determinations were also made of the calcium content of the bodies of rats at different ages which had been raised on a diet of one-sixth whole milk powder and five-sixths whole wheat, this diet furnishing considerable less calcium than the one-third whole milk two-thirds whole wheat diet. As was to be expected, there was a lower percentage of calcium in the bodies of the animals on the former diet. The addition of 1 per cent of cod-liver oil to this diet did not raise, but of 1 per cent of calcium lactate did raise the content of calcium to normal values.

In commenting upon this difference, the authors state that "we believe that it is well to emphasize strongly the importance of the fat-soluble vitamins in nutrition, but evidently for optimal storage of calcium in the normal young even a liberal allowance of cod-liver oil was less effective than the simple increase in the calcium content of the food."

Changes in the intestinal flora of rats on a calcium deficient diet, R. E. Hoffstadt and S. J. Johnson (*Amer. Jour. Hyg., 5 (1925), No. 6, pp. 709–723, figs. 7*).—As judged by the bacteriological examination of the feces of rats kept for varying periods of time on calcium-deficient diets and the appearance on autopsy of those which had died or were killed after a considerable time on the defective diets, the authors conclude that a calcium-deficient diet causes definite constipation accompanied by a lowering of the aerobic bacterial content of the feces. The changes in the bacteria are thought not to be the cause but the result of constipation. The loss of elasticity and the thinness of the walls of the small intestines are suggested as being the most important factors contributing to the constipation.

The effect of the bacterial flora on the biological test for vitamin B, V. G. Heller, C. H. McElroy, and B. Garlock (*Jour. Biol. Chem., 65 (1925), No. 1, pp. 255–264, figs. 3*).—By a comparison of the growth of rats under different methods of housing with respect to the use of shavings as bedding and screens to prevent access to the feces, data have been obtained confirming the conclusions first reported by Steenbock, Sell, and Nelson (E. S. R., 49, p. 665) that rats which have access to their feces do not respond as readily to vitamin B deficiency as those which do not. A possible explanation of this is suggested by the data reported on the bacterial count of both spore-forming and nonspore-forming organisms of the feces of the rats in the various groups.

It was found that the feces of the rats which had access to their feces contained a much larger number of organisms, particularly of the spore-

forming type, than those of animals prevented from consuming their feces. It is concluded that organisms naturally present in the intestinal tract synthesize and store vitamin B. In proof of this, growth curves are given of two rats whose growth had been brought to a standstill on a vitamin B deficient diet, but was promptly renewed when pure cultures of the spore-bearing organisms isolated from the feces and grown in a vitamin B-free medium were used as the source of vitamin B.

The animals receiving roughage, such as agar or shavings, made better growth than those kept under like conditions without roughage. Since extracts of the roughage used were found to contain no vitamins, the enhanced growth is attributed to the favorable effect of added bulk.

Experimental rickets in rabbits, H. GOLDBLATT and A. R. MORITZ (*Jour. Expt. Med., 42 (1925), No. 4, pp. 499–506, pls. 3*).—After experiencing considerable difficulty in the selection of a rachitic diet suitable for rabbits, it was found that an ordinary rachitic diet low in phosphorus and the antirachitic vitamin and high in calcium could be used with a roughage supplement of 5 gm. of alfalfa hay previously extracted with boiling alcohol and ether. On this diet typical rickets preventable by cod-liver oil developed within a week or 10 days. In the rachitic animals the calcium content of the blood was slightly higher and the inorganic phosphate of the serum decidedly lower than in the controls.

Observations on the use of dihydroxyacetone in the treatment of diabetes mellitus (preliminary report), I. M. RABINOWITCH (*Canad. Med. Assoc. Jour., 15 (1925), No 4, pp. 374–381, figs. 9*).—Clinical and laboratory observations are reported on the effect upon the blood sugar of the administration of dihydroxyacetone, $CH_2OH.CO.CH_2OH$, to normal and diabetic individuals.

In the normal subjects, within an hour following the oral administration of 50 gm. of dihydroxyacetone there was a slight increase in the blood sugar, followed by a decrease to values below the normal level. Dihydroxyacetone was detected qualitatively in the urine. The diabetic patients showed greater tolerance to dihydroxyacetone than to glucose. The increase in blood sugar was not so marked, and the time necessary to return to normal level was shorter. In two cases dihydroxyacetone was substituted for a short time for part of the day's requirement of insulin, with deduction of an equivalent amount of glucose.

A case of diabetic coma treated with dioxyacetone, with recovery, I. M. RABINOWITCH (*Canad. Med. Assoc. Jour., 15 (1925), No. 5, pp. 520–522, fig. 1*).—The author reports the successful treatment of a case of diabetic coma by the repeated administration of small doses of dihydroxyacetone. Eight gm. were given every 15 minutes for 2 hours, followed by 5 gm. at longer intervals. There was slow but steady improvement in the various symptoms until at the end of 12 hours, after 66 gm. had been given, the patient was mentally clear.

Blood sugar time curves following the ingestion of dihydroxyacetone, I. M. RABINOWITCH (*Jour. Biol. Chem., 65 (1925), No. 1, pp. 55–58, fig. 1*).—In this supplement to the papers noted above, blood sugar time curves are given for seven normal and seven diabetic individuals following the ingestion of small doses of dihydroxyacetone. In general the content of blood sugar 30 minutes after the ingestion of the dihydroxyacetone was slightly higher than before, following which there was a gradual but irregular decrease to values below normal. It is noted that it has been possible to substitute dihydroxyacetone for doses of insulin without deducting a corresponding quantity of other carbohydrates from the diet.

TEXTILES AND CLOTHING

Proceedings of the American Association of Textile Chemists and Colorists (*Amer. Dyestuff Rptr., 14 (1925), No. 22, pp. 851–866, 875–890, figs. 7; Amer. Dyestuff Rptr., Sample Swatch Quart., 1926, Jan., pp. 3–36, figs. 5*).—A report is given of the fifth annual meeting of the association held at the Massachusetts Institute of Technology, Cambridge, Mass., in December, 1925. Besides committee reports on research and fastness to light, washing, and perspiration, the following papers were presented: Effect of Alkalies on Wool—Importance of pH, by H. C. Chapin; Hydrogen Ion Concentration—Its Relation to Problems of Dyeing, by W. M. Scott: Quantitative Studies of the Action of Alkalies (Caustic Soda) on Rayon Silks and of Their Relative Hygroscopic Properties, by A. K. Johnson; Suggestions for a Simple Standard for Testing the Fastness of Dyed Materials to Light, by W. F. Deady; A New Lamp for Fading Tests, by W. D. Appel; Waterproofing Textile Fabrics, by H. P. Pearson; Recent Developments in the Coloring of Acetate Silk, by H. R. Davies; The Dyeing of Vat Colors on Rayon, by F. F. Warshaw; Developments in the Naphthol AS Series, by H. E. Hager and W. R. Marsson; Oiling of Cotton Preliminary to Spinning, by E. H. Hinckley; Some Phases of Cotton Oiling Process and Its Relation to Finishing, by R. B. Earle; Dyeing of Viscose Rayon with Mordant Dyes, by W. C. Durfee; and The Dyeing of Silk White Effects on Woolens and Worsteds, by A. A. Claflin.

Testing and standardization in the cotton industries, W. F. Edwards (*Cotton, 90 (1926), No. 3, pp. 226–230, figs. 3*).—The merits of tests for strength, elongation, and moisture content and stress-strain diagrams, as applied to yarns and fabrics, are discussed briefly.

Effect of twist on the physical properties of a number 7s yarn, F. R. McGowan, C. W. Schoffstall, and A. A. Mercier (*U. S. Dept. Com., Bur. Standards Technol. Paper 278 (1925), pp. 85–95, pls. 2, figs. 9*).—The most suitable twist was sought for the manufacture of yarns to make duck for post-office mail bags (E. S. R., 53, p. 737). The limits of the twist with the organization used for spinning a 7s yarn of Pima cotton were from 7 to 19 turns per inch, for which range the angle of twist varied from 19 to 38°. Contraction equivalent to a range of 17 per cent based on the weight of the lowest twist was noted. The diameter of the yarn varied considerably, but like the fuzziness of the yarn, decreased as twist increased. While the region of greatest strength was between 11.5 and 16 twists per inch, the twist selected as most suitable was 11.8 turns per inch.

The micrometer caliper as an instrument for measuring the diameter of wool fibers, R. H. Burns and W. B. Koehler (*Wyoming Sta. Bul. 141 (1925), pp. 15–28, figs. 4*).—Using wool samples from various American and Australian sources, the micrometer caliper and the microscope having a filar mikrometer were compared as instruments for determining the diameters of wool fibers. See also an earlier note (E. S. R., 39, p. 774).

The average microscopic measurements of any wool sample always exceeded the average caliper measurements, the difference for all practical purposes amounting to 0.0001 in. The larger fibers did not give as great a proportionate difference of diameters as measured by the two instruments as did the smaller fibers. No important difference attributable to the difference in the softness of the samples measured was found. It is said that students can measure wool much easier with the micrometer caliper than with the microscope.

Laboratory tests of wool shrinkage, J. F. Wilson (*Natl. Wool Grower, 15 (1925), No. 7, pp. 20, 21, fig. 1*).—A method of determining shrinkage by scouring small samples, devised at the University of California, is outlined, and a fleece breaker for the preparation of laboratory samples is described.

The influence of sunlight on wool, W. v. BERGEN (*Jour. Soc. Dyers and Colourists, 41 (1925), No. 7, p. 252*).—An account of researches on the difference in behavior of the tips of wool fibers as compared with the less exposed parts was presented at the annual meeting of the International Society of Textile Chemists held at Zurich in May, 1925. Such differences were very apparent in dyeing with certain coloring matters.

Exposure to sunlight seemed to result in destruction or removal of the epithelial cells, for when placed in dilute sodium hydroxide the exposed fibers swelled greatly and curled characteristically, while the undamaged parts remained unaltered. Losses sustained by heating the tips with water for 2 hours were belly 0.25 per cent, sides 0.75 per cent, and back 4.5 per cent. Brown wool tips were the least affected, then followed gray, and white were the most damaged. After exposing wool which had been treated with water, acid, and alkaline solutions to sunlight, the wool which had been wetted with sulfuric acid (0.5 per cent) was found to be far more tendered than wool wetted with soda (1 per cent). After exposure to sunlight more acid was found in the acidulated fiber than had been put in, this being explained by the generation of free acid in the fiber from the sulfur contained in the fiber.

A proposed system of tests for the fastness of dyestuffs on wool, H. R. HIRST (*Jour. Soc. Dyers and Colourists, 41 (1925), No. 11, pp. 347–354*).—Based on practical trade experience and on available literature, methods for testing the fastness of dyes on wool yarns and fabrics to meet requirements of manufacturer and wearer are outlined in this contribution from the British Research Association for the Woollen and Worsted Industries.

Fastness of dyes on silk, W. S. DENHAM (*Brit. Silk Research Lab., Univ. Leeds, Rpt. 21 (1925), pp. 24*).—This report from the laboratory of the British Silk Research Association consists of proposed standards of fastness of dyes on silk in the yarn and fabric with respect to light, water, washing, degumming, and perspiration. Under each of these groups is given a description of the tests employed, the grades of fastness, and the standards, with methods for their use, together with a tabulated classification of selected dyes with reference to these standards. A final table gives a classification with reference to the selected standards of a large number of dyes commonly used for silk.

The effect of washing agents on linen and cotton fabrics, E. E. TURNBULL and M. G. SUPPLE (*Jour. Home Econ., 17 (1925), No. 7, pp. 382–387*).—The tests reported were arranged to duplicate as far as possible household conditions of washing cotton and linen fabrics in an effort to determine the effect upon the life of the fabric of repeated washings with a neutral soap and with two kinds of washing powder, one composed chiefly of soap and the other high in carbonate. Observations on the tensile strength, thread count, shrinkage, and general appearance of the two materials were made before washing and after 10, 25, 40, and 50 washings. Distilled water was used in making the solutions of the washing agents and tap water for rinsing.

All of the washing agents tested (including water alone) had a gradually increasing weakening effect upon the linen fabric. Soap and soap powder had a strengthening effect on the cotton fabric for the first 25 washings, and thereafter a marked weakening effect. All of the washing agents except the soap washing powder produced a marked gray discoloration in both fabrics on repeated washing.

Soaps, M. H. ITTNER (*Jour. Home Econ., 17 (1925), No. 4, pp. 189–194*).—A practical discussion in nontechnical terms of the physical and chemical processes involved in the manufacture and cleansing action of soap, with a description of the essential features of the various types of soap.

MISCELLANEOUS

Forty-eighth Report of the Connecticut Agricultural Experiment Station, 1924, W. L. SLATE, JR., ET AL. (*Connecticut State Sta. Rpt. 1924, pp. [9]+583+34T+XVI, pls. 40, figs. 64*).—This report contains the organization list, a report of the board of control, a financial statement for the fiscal year ended June 30, 1924, and reprints of Bulletins 261–269 and Tobacco Substation Bulletin 5, all of which have been previously noted, and of the following Bulletins of Immediate Information: Nos. 48, Practical Lawn Suggestions, by M. F. Morgan; 49, Regulations for Carrying out the Provisions of the Law concerning Concentrated Commercial Feeding Stuffs; and 50, Regulations concerning the Shipment of Nursery Stock, and the New Law, by W. E. Britton.

Forty-fourth Annual Report of the New York State Agricultural Experiment Station, [1925], R. W. THATCHER (*New York State Sta. Rpt. 1925, pp. 51*).—This contains the organization list, a review of the work and publications of the station, and a financial statement for the fiscal year ended June 30, 1925. The experimental work reported is for the most part abstracted elsewhere in this issue.

What the station can do, R. W. THATCHER (*New York State Sta. Circ. 81 (1925), pp. 7*).—The function of the station is explained, and its limitations as regards addresses, analyses, seed examinations, personal inspection of farms, and preparation of miscellaneous agricultural literature are outlined.

The Quarterly Bulletin [of the Michigan Station], edited by R. S. SHAW and E. B. HILL (*Michigan Sta. Quart. Bul., 8 (1925), No. 2, pp. 57–94, figs. 9*).—In addition to articles abstracted elsewhere in this issue, this number contains a list of available bulletins.

Bimonthly Bulletin of the Ohio Agricultural Experiment Station, [January–February, 1926] (*Ohio Sta. Bimo. Bul., 11 (1926), No. 1, pp. 40, figs. 23*).—This number contains, in addition to several articles abstracted elsewhere in this issue, the following: Certified Clover Seed, by L. E. Thatcher, and The Potato Situation, by R. F. Taber.

NOTES

Purdue University and Station.—M. L. Fisher, head of the department of agronomy and assistant dean of the school of agriculture, has been appointed dean of men. A. G. Philips, head of the poultry department, has resigned to engage in commercial work, and has been succeeded by C. W. Carrick, formerly associate in the department. Other appointments include Dr. H. R. Kraybill of the Boyce Thompson Institute as State chemist, thereby filling a vacancy existing since the death of E. G. Proulx, and J. H. Hilton as assistant in dairy husbandry in the extension staff.

Nebraska University and Station.—H. D. Fox, instructor in animal husbandry and assistant animal husbandman, has resigned to engage in commercial work.

Rutgers University and New Jersey Stations.—A bequest of $20,000 to the university is provided in the will of the late Richard W. Herbert of the class of 1878, recently probated at Freehold. Under the terms of the will, the fund is to be invested and the proceeds used for the maintenance of scholarships in the College of Agriculture.

According to a note in *New Jersey Agriculture*, George W. Musgrave, associate professor of agronomy in the college of agriculture and agronomist in the stations, has been given a year's leave of absence to take charge of experimental work to be carried on by the American Cyanamide Company.

New Mexico College and Station.—Harry W. Titus, associate professor of animal nutrition and nutrition chemist, has resigned to become associate biological chemist in the nutrition investigations in the Bureau of Animal Industry, U. S. D. A., with headquarters at Beltsville, Md.

Pennsylvania College and Station.—The resignations are noted of W. T. Tapley, professor of vegetable gardening, effective April 1; Brandon Wright, as assistant professor of agricultural extension; M. H. Brightman, as assistant professor of poultry husbandry, effective July 10; and Mattie Creighton, as graduate assistant in biological chemistry. Recent appointments include Raymond J. Miller, Ph. D., as associate professor of agricultural and biological chemistry; James E. Knott, Ph. D., as associate professor of vegetable gardening, effective April 1; T. B. Charles, as assistant professor of poultry husbandry, effective July 1; Fred F. Lininger, as assistant professor of agricultural economics; and James F. Keim, as instructor in agricultural extension.

South Dakota College.—The contract for a new library building has been let, to cost about $200,000. This is the first building to be erected from the proceeds of a tax on cigarettes of 3 cents per package passed by the last legislature.

Tennessee University.—The corner stone of the new home economics building, a 3-story structure, was laid March 8. Construction is going on actively, with the expectation that the building will be ready for occupancy by the fall term.

Virginia Truck Station.—Fred W. Poos, formerly with the Bureau of Entomology, U. S. D. A., has accepted the position of entomologist and entered upon his duties March 20.

West Virginia University and Station.—Recent construction includes a new calf barn at the dairy farm, a wing to the cattle barn at the agronomy farm, and a barn for young livestock at the Reymann Memorial Farms.

New Journals.—*Rural Industries* is a quarterly journal of the Rural Industries Bureau, London, which was founded in 1921 under a grant from the Development Fund. The object of the journal is "to supply those interested in country industries with an accurate account of what is being done in various counties and by various organizations to promote their development and revival and to give from time to time information about partcular rural trades and crafts."

Riz et Riziculture is being published by the rice section of the Promotion Committee of Colonial Scientific Research of France. The initial number contains articles on the progress of rice culture, rice culture in Madagascar, rice growing by machinery, and a contribution to the biological study of rice dealing with the structure of the vegetative organs at maturity, as well as numerous abstracts dealing with rice, statistical data, etc.

Matériaux pour l'Etude des Calamités, published by the Geographical Society of Geneva under the auspices of the International Red Cross Committee and the League of Red Cross Societies, is being issued quarterly. One of the initial numbers contain an article entitled "The Locust Problem and Its International Solution," by Paul Vaysiérre.

Journal of the Pan-Pacific Research Institution is being issued quarterly by the Pan-Pacific Union, as a "periodical record of investigations bearing on problems of food production, distribution, conservation, and consumption, as well as on public health, and race and population problems as related to the countries bordering on the Pacific." The initial number, which is printed as part of the *Mid-Pacific Magazine*, contains considerable data as to the objects of the Pan-Pacific Research Institution, its organization, and similar matters. The ensuing number, which appears separately, contains an account of Institutes for Research Work in the Interest of Agriculture in the Netherlands Indies, by Dr. P. J. S. Cramer, director of the experiment station of the department of agriculture at Buitenzorg, Java.

Landbouw, the organ of the Union of Agricultural Councils of Netherlands East Indies, is being published bimonthly at Buitenzorg. The initial number contains three original articles entitled, respectively, "Directions for Fruit Growing in the Netherlands East Indies," by J. J. Ochse; "Unfavorable Water Supplies," by J. T. Metzelaar; and "The Horticulture Exhibition at Patjet," together with brief notes, abstracts, etc.

Züchtungskunde is being published monthly by the German Breeders' Association of Göttingen. The initial number contains original articles on the Status of Animal Holdings and the Supply of Animal Products in Germany in 1924–25, by F. Keiser, and Feeding Experiments with Cornstarch By-products, by J. Hansen, W. Dietrich, and H. Vogel.

Ex Libris, "a journal devoted to the professional interests of business, agriculture, engineering, and the social sciences," is being issued quarterly. One of the articles in the initial number is the Raw Materal Markets, by J. A. de Haas.

Revistat de Fitopatologia is being published at Madrid by the Spanish Laboratory of Forest Fauna. The initial numbers are devoted largely to original articles, mainly on forest entomology, with a few abstracts.

Porto Rico Health Review is being issued monthly as the official bulletin of the Department of Health of Porto Rico. The initial number is devoted mainly to brief original articles, but contains numerous abstracts from health journals.

Forstarchiv, a review of the scientific and technical progress in forestry, is being issued semimonthly, containing both original articles and abstracts.

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EXPERIMENT STATION RECORD

VOL. 54 MAY, 1926 NO. 7

The custom inaugurated many years ago of interpreting in these columns the successive acts making appropriations for the support of the Federal Department of Agriculture finds continued justification in the general interest in the prospective financial resources and lines of development of the Department and the difficulties commonly encountered in attempting to utilize the appropriation acts as a basis of information without considerable explanation. These difficulties are due primarily, of course, to the fact that the act for one year is seldom directly comparable with that of another because of the omission or inclusion of numerous items. There are also, however, other factors which must be taken into account, such as the Department's funds from other sources—the so-called "permanent" and "deficiency" appropriations—and the frequent designation of appropriations as "immediately available" or "available until expended" instead of for a precise fiscal year.

In a comparison of the latest of these acts, signed May 11, 1926, with its immediate predecessor, all of these complicating elements enter in, but their influence is much less important than for several years. The total amount available under the new act, covering the fiscal year ending June 30, 1927, will be $127,924,573, an apparent increase of $1,940,132 over the 1926 appropriations. It is partially offset, however, by the expiration of a 10-year grant of $1,000,000 per annum for the cooperative construction of roads and trails in the national forests. This and other small changes have resulted in a net decrease in the "permanent and special" appropriations from $12,340,750 to $11,351,250, and has brought the total available for the Department in 1927 to $139,275,823. This is an apparent increase of $1,200,632.

Viewed from the standpoint of agriculture, the real situation is still considerably obscured by the large appropriations for road construction. The total for this purpose carried in the act is $80,000,000. Eliminating such items, the total amounts available for other purposes for 1926 and 1927 are $57,075,191 and $59,275,823, respectively, a net increase of $2,200,632, or slightly less than 4 per cent.

This increase, which perhaps is the most significant figure which can be adopted for the purposes of this discussion, is for the most part concentrated in a few major allotments. Among them are $1,100,000 additional for the payment of indemnities to farmers in connection with tuberculosis eradication work, $750,000 being made immediately available; $480,000 additional for the increased payment to the States under the Purnell Act; $200,000 for reprinting the well-known publications of the Department on the diseases of horses and cattle; $168,000 for increased telegraph rates in connection with the weather service; and $111,370 for additional expenses in combating the European corn borer. There are also numerous smaller items of increase, but their aggregate is substantially offset by decreases scattered through the act totaling $793,277.

The act is the fourth since the institution of the budget system, and it received the usual prolonged consideration, nearly a year elapsing between the preparation of the preliminary estimates by the Department and the assent of the President to the completed measure. At no stage, however, was it a subject of serious controversy, indicating the general acceptance of the Department's policies and programs and reflecting the prevailing confidence of the people in its work. As a whole, the recommendations of the Bureau of the Budget were again adhered to, the principal changes made by Congress being the appropriation of $5,000,000 less for the Federal aid highway system, the restoration of many of the small reductions proposed from previous appropriations, and the provision of some additional increases and a few new projects.

Taking up the various branches of the Department in turn, the Office of the Secretary receives $8,566,820. This includes as its principal items the usual payment to the States under the Hatch and Adams Acts of $1,440,000 and a like amount under the Purnell Act, $1,300,000 for the supplementary extension work under the Smith-Lever Act, and $1,308,540 for the Department's own cooperative extension work, but not the Smith-Lever funds themselves of $4,580,000, as these are among the permanent appropriations. No change is made in the allotment of $738,000 for the Department's printing and binding, but $200,000 additional is provided for the publications already referred to on the diseases of horses and cattle. The Office of Editorial and Distribution Work is rechristened the Office of Information, and the appropriation formerly carried separately for the Division of Accounts and Disbursements has been merged with that of other salaries of the Secretary's Office.

The Department's funds for rent of buildings in the District of Columbia are fixed at $195,366, with $10,000 additional for the Fixed Nitrogen Research Laboratory. Provision is also made for the

immediate purchase of additional land for the Department's experimental farm at Beltsville, Md., at a cost of not to exceed $35,000. A tract of land immediately adjoining the present animal husbandry experimental farm and now under lease is to be acquired, thereby adding 1,062.5 acres, of which about 250 acres are open pasture and tillable land, 450 acres pasture and brush land, and 362 acres woodland.

The general funds available for the Office of Experiment Stations are enlarged to $124,566, of which $115,686 may be expended for salaries in the District of Columbia. This is an increase of $20,000 in the resources of the Office and is a result of the passage of the Purnell Act, which has materially enlarged the work of the Office and broadened its responsibilities. It is expected that the increased funds will be utilized largely in the employment of additional specialists who will assist in the administration of the Federal acts dealing with the experiment stations. This expansion will, of course, involve no change in the general policies of the Office and its relations with the stations, but it should permit of closer contacts with them in the organization and conduct of their work and a more intimate leadership, especially in rural economics and sociology, home economics, and others of the newer fields.

The allotments for the maintenance of the experiment stations in Alaska, Hawaii, Porto Rico, and the Virgin Islands are continued at $76,240, $54,940, $56,460, and $22,180, respectively. The Guam Station receives $24,160, an apparent increase of $3,300, but since a deficiency appropriation from which $3,780.88 was available in the fiscal year 1926 for combating the coconut scale has been terminated, the actual result is a reduction of $480.88.

The Weather Bureau is granted $2,569,080, as compared with $2,343,192 in the previous act, plus deficiency appropriations of $168,312 for increased telegraph rates and $2,500 to extend the forest-fire weather-warning service. An allotment of $38,000 is made immediately available for the erection of a Weather Bureau building at East Lansing, Mich., and provision is included for additional field stations in the new cotton regions of the Southwest and at Austin, Tex., for maintaining a service in the State of Washington to assist in forest fire control, and for additional frost warning work in the Eastern States.

The new appropriations for the Bureau of Animal Industry aggregate $9,477,763, and these are as usual supplemented by the $3,000,000 permanent appropriation for meat inspection. The net increase from $3,560,000 to $4,653,000 in the funds for tuberculosis eradication already referred to is a result of large appropriations which are being made by the States under a cooperative under-

standing, aggregating for 1925 $6,927,500 and for 1926 $9,928,500. It is of interest to note that in 1925 7,000,028 cattle were tested, of which 3.1 per cent were reactors, and that the number of accredited cattle has reached 1,275,063.

An increase of $20,000 in the allotment for the bureau's inspection and quarantine work will enable a more comprehensive examination of imports of animal by-products at points of entry to exclude livestock diseases, such as foot-and-mouth disease. The funds provided for the eradication of the cattle tick and hog cholera are $699,450 and $428,263, respectively, substantially as for 1926, while those for the dourine and foot-and-mouth disease campaigns, which seem to be approaching completion, are reduced from $40,520 to $30,000 and $10,980 to $5,000, respectively. Steady progress is again reported in the tick campaign, just closing its twentieth year. Late in 1925 the State of North Carolina was released from quarantine, leaving for the entire region only 261 of the 984 counties originally infested.

The allotment for animal husbandry investigations is $350,080. This involves the elimination of the horse-breeding work at Laramie, Wyo., and an increase of $5,180 in the funds for poultry experiments at Glendale, Ariz. There is also an increase of $2,000 carried elsewhere in the act for the more extended development of the experimental work in animal production and dairying under dry-land conditions which is under way at Ardmore, S. Dak.

The total for the Bureau of Plant Industry is $3,908,055, substantially as for the previous year, but with a considerable number of relatively small readjustments of funds. Among the items of increase are $10,000 additional for a study of crown gall infection of nursery stock; $3,500 additional for fruit disease work at the Wenatchee, Wash., field laboratory and a like amount for extending the fruit disease investigations in Georgia; $20,000 additional for the white pine blister rust campaign to extend the work in the Northwestern States; $2,960 for studies of concentrated fertilizers and $10,000 for fertilizer experiments with sugar beets; $3,000 for the enlargement of the tobacco studies at Tifton, Ga.; $9,000 for breeding and testing sugar beets; $2,400 for blueberry studies in North Carolina; and $5,000 for an enlargement of the peach utilization studies in the Southeastern States. On the other hand, there are decreases of $6,611 for salaries and administrative expenses, $2,738 for crop acclimatization work, $1,989 for the foreign seed and plant introduction, $1,515 for the bacteriology and nutrition projects, $1,000 for general pathological studies, and smaller amounts for work with cotton and truck-crop diseases, crop physiology, drug and other

plants, the seed testing laboratories, the studies of alfalfa and drought-resistant crops, western irrigation agriculture, pomological and horticultural investigations, nursery stock investigations, the experimental gardens and grounds, and the Arlington Experimental Farm, while the elimination of a provision carried for many years for the purchase and distribution of new and rare seeds in cooperation with members of Congress signifies a further reduction of $36,600.

The Forest Service receives $8,285,507, together with $1,000,000 for the acquisition of additional land at the headwaters of navigable streams, $75,000 (an increase of $25,000) for the cooperative distribution of forest planting stock, $710,000 (an increase of $50,000) for cooperative forest fire prevention and suppression, $50,000 for assistance to farm owners in forest problems, and $5,000,000 for the construction of forest roads and trails. These various appropriations, coupled with $3,771,250 from the permanent appropriations, make a total of $18,891,757 for forestry work. Authority is also granted the Department to apportion and enter into contracts for $6,225,000 additional which was authorized to be appropriated for use during 1927 by previous legislation, so that the full resources will aggregate $25,116,757. The expenditures will, as usual, be offset to a considerable degree by the receipts from the national forests, which in 1925 amounted to $5,000,077.

An increase of $47,980 for silvical investigations will be utilized in establishing an additional forest experiment station, authorized on March 3, 1925, and for extending the facilities of the Appalachian Station at Asheville, N. C. The new station will be located in California and will be the ninth in the system of regional stations now in operation.

Other items for which the Forest Service received increases were those for general administration, for which $30,000 additional is provided because of the organization into 13 national forests of 210,420 acres of land in military reservations scattered from New York to Alabama and Illinois, and $15,000 additional for increased sanitary facilities on national forest camp grounds, now visited by over 10,000,000 persons each year. The latter increase is partially offset by a reduction elsewhere of $5,000 for national forest improvements.

Another increase of $20,000 is for forest products investigations. Of this amount, $5,000 is to develop a process for resin removal from white pine used for paper making and the remainder for miscellaneous investigations.

The Bureau of Entomology receives a net increase from $2,554,743 to $2,625,168. The largest single item of increase is that of $111,370 already referred to for preventing the spread of the European corn borer, making available for this purpose $485,000, of which $55,000 is to be used for research in this country and $35,000 for parasite introduction. There is also an increase of $5,000 for control work with the Asiatic beetle in Connecticut, but a net decrease of $34,500 in the funds for the gypsy and brown-tail moth campaign. Other increases provide $7,300 additional for studies of codling moth control in Kansas, $3,135 to combat the alfalfa weevil, $10,000 for sugar beet leafhopper studies, and $5,000 for wireworm studies in the State of Washington. The establishment of a bee laboratory in Wyoming at a cost of $10,000 is authorized as a new item.

A reduction in the appropriations for the Bureau of Biological Survey from $1,372,768 to $987,365 is due largely to the elimination of a $375,000 allotment for land purchases for the Upper Mississippi River game refuge, although there are also several minor curtailments. An increase of $4,905 is accorded the bureau to meet the increased cost of administration of the Alaska game law.

The total for the Bureau of Agricultural Economics, $4,746,397, shows little change from its previous allotment of $4,738,056. Increases of $55,402 for the market news service and $5,000 for an inspection service for fruits and vegetables in Florida are approximately counterbalanced by reductions of $30,000 because of the completion of the wool work of the War Industries Board and a special survey of retail meat marketing, $4,395 for crop and livestock estimates, and $17,666 for salaries and certain administrative expenses.

An extension of the Grain Futures Administration to commission houses not members of clearing associations is provided for by an increase in its funds from $111,530 to $121,530, but the allotment for the enforcement of the Packers and Stockyards Act is reduced from $480,000 to $440,000. The appropriation for the collection of farmers' seed grain loans is reduced to $15,000.

The enforcement of the Plant Quarantine Act by the Federal Horticultural Board is strengthened by the allotment of $45,000 additional for port inspection service and $10,000 for inaugurating export inspection and certification on fruits, vegetables, nursery stock, and similar material. The extermination of the potato wart disease has permitted the elimination of its allotment of $5,110.

The work of the remaining branches of the Department is continued substantially on the previous basis. The Bureau of Home Economics is granted $10,000 additional for a dietary survey, making its total $127,244. An apparent increase from $68,180 to

$84,180 for the Department Library is due entirely to transfers in personnel. The totals for the Bureau of Dairy Industry (formerly the Bureau of Dairying) and the Bureaus of Chemistry, Soils, and Public Roads show reductions of $1,546, $10,582, $65,380, and $21,285, respectively, making their new allotments $495,094, $1,491,-606, $588,480, and $463,679. In the case of the Bureau of Soils the decrease consists mainly in the provision for the Fixed Nitrogen Research Laboratory, hitherto supported from funds carried in the National Defense Act, but now directly maintained with a curtailment of $65,000.

Since the passage of the appropriation act two additional measures have been enacted which are of considerable interest to the Department and its personnel. One of these is designed to provide uniform rates of disbursement for Government employees on travel duty. Considerable diversity has prevailed among the different departments, but the subsistence rates prescribed for the Department of Agriculture for many years of not to exceed $4 on a per diem basis or $5 on the basis of actual expenses has been generally recognized as having become inadequate under many conditions. Under the new act, which becomes effective July 1, the heads of departments may promulgate regulations with the approval of the President as to travel allowances, with a maximum per diem in this country of $6 or of not to exceed $7 on the basis of actual expenses. For travel outside of the continental United States these maxima are set at $7 and $8 per day.

The second measure is a public buildings act, signed by President Coolidge May 25. An appropriation of $50,000,000 is authorized for building projects in the District of Columbia, of which not more than $10,000,000 may be expended in any one year. Decision as to the apportionment of this amount is entrusted to the Secretary of the Treasury, and at the time of writing formal announcement is not available on numerous details, but it is expected that funds aggregating over $8,000,000 will be devoted to the needs of the Department of Agriculture and that a comprehensive program to this end will be instituted within the coming year. The plans as tentatively announced include the early completion of the Department's main building by the erection of a center which will join together the laboratory wings completed in 1908, the purchase of one of the buildings now being rented by the Department, and the erection of a large office building in the general vicinity. The Department's housing problem, which with over 25 scattered buildings now under lease in Washington has been acute for several years, will, of course, be greatly simplified by such action.

Considering the various legislative measures as a whole, the net result for the Department seems very encouraging. There are few spectacular innovations in the appropriation act, but there are many evidences of a general recognition of the importance of the uninterrupted development of most of the existing lines of work, and considerable insistence upon the adequate control of specific pests and diseases and similar undertakings. The supplementary measures relating to travel expenses and new buildings also seem destined to be of great advantage, and should ultimately improve greatly the working conditions and contribute materially to the efficiency of the Department and its personnel.

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

Proceedings of the fortieth annual convention of the Association of Official Agricultural Chemists, 1924 (*Jour. Assoc. Off. Agr. Chem., 8 (1925), Nos. 3, pp. 215–327, figs. 14; 4, pp. 329–467, figs. 11; 5, pp. 469–591, figs. 2; 6, pp. 593–725, figs. 5*).—This is the complete report of the convention held at Washington, D. C., October 20–22, 1924. Abstracts of some of the papers presented are given elsewhere in this section.

German-English-French-Spanish dictionary for the chemical industry, edited by E. HELLBUSCH (*Deutsch-Englisch-Französisch-Spanisches Fachwörterbuch für den Chemikalienhandel und die Anschliessenden Gebiete. Berlin: R. Bredow, 1921, pts. 1–5, pp. V+87+100+96+101+19*).—This chemical dictionary is arranged in five parts. Part 1 contains in parallel columns corresponding terms in German, English, French, and Spanish; part 2, English and German; part 3, French and German; and part 4, Spanish and German. Part 5 consists of English, French, and Spanish abbreviations, with their meanings in the same language and translation into German, and a summary of the most common coinage and units of weight in world commerce.

Viscosity studies with Nebraska wheat flours, M. J. BLISH and R. M. SANDSTEDT (*Cereal Chem., 2 (1925), No. 4, pp. 191–201*).—To determine the value of the viscosity test as a measure of the baking quality of Nebraska wheat flour more than 100 samples of Nebraska wheat collected during the season of 1922 were experimentally milled and the flour used for baking tests and for determinations of protein content and viscosity (MacMichael viscosimeter) with and without preliminary removal of electrolytes. Coefficients of correlation were computed for loaf volume (as representing baking strength) and actual viscosity with and without removal of electrolytes, ratio of these viscosities to protein content, and total flour protein. The correlation between viscosity and protein content was also computed.

There was a low positive correlation between loaf volume and protein content and between actual viscosity and loaf volume, a still lower positive correlation between loaf volume and actual viscosity after removal of electrolytes, little or no correlation between loaf volume and ratio of actual viscosity to protein content, and a high positive correlation between actual viscosity and protein content. These results are thought to indicate that for the particular series of flours tested protein content is a more valuable criterion than actual viscosity for predicting flour strength.

The constant *b* suggested by Gortner (E. S. R., 53, p. 314) as a measure of gluten quality, the diastatic value, and the glutenin content were determined for 19 flours, all but 1 from the 1923 crop of Nebraska wheat. No useful relationship could be established between *b* and loaf volume even among flours of similar protein content. The ratio of total protein to glutenin content was remarkably constant, but there was no constant relationship between glutenin content or diastatic value and the constant *b*.

It is concluded that no viscosimetric procedure has yet been perfected by means of which gluten strengths of Nebraska wheat flours can be predicted with accuracy, and that there is some important factor aside from gluten quality, glutenin content, and diastatic value which determines baking strength in Nebraska wheat flours.

Preparation, solubility, and specific rotation of wheat gliadin, D. B. DILL and C. L. ALSBERG (*Jour. Biol. Chem., 65 (1925), No. 2, pp. 279–304, figs. 2*).—The method of preparing gliadin adopted in the present study was based on the methods of Osborne and Harris (E. S. R., 18, p. 910), Gróh and Friedl (E. S. R., 33, p. 162), and Woodman (E. S. R., 49, p. 308). Two important modifications were introduced: (1) The precipitation in aqueous solution was made with vigorous shaking, resulting in the formation of a foam which could be easily and thoroughly washed, and (2) lithium chloride was used instead of sodium chloride to promote precipitation, with the result that a practically ash-free preparation was obtained on account of the solubility of lithium chloride in ether and alcohol. Five preparations of gliadin were obtained, one from a commercial family patent flour, two duplicate preparations from a Kansas Kharkof flour, and two from a Turkey Red flour. The average nitrogen content of these preparations on a dry basis was 17.54 per cent.

In the solubility studies it was found that gliadin may be irreversibly altered under certain conditions with suitable alcohol-water mixtures. On cooling solutions of gliadin in alcohol-water mixtures of varying proportions, turbidity appeared at definite temperatures varying with the proportion of alcohol in the solvent but practically independent of the concentration of the gliadin. This temperature has been defined as the critical peptization temperature, and such temperatures were determined for methyl-, ethyl-, and *n*-propyl alcohol-water mixtures. The amount of peptization of gliadin at room temperature in the different alcohols increased in the above order. At temperatures above the critical there appeared to be no limits to the solubility of gliadin in the mixed solvent. Gliadin was found to be soluble in solutions of potassium and ammonium thiocyanate, potassium iodide, urea, isopropyl alcohol, and chloral hydrate, and also in glycerol, ethylene glycol, each of the propylene glycols, mixtures of water with each of these, mixtures of glycerol and absolute alcohol containing more than 25 per cent glycerol, and mixtures of water with methyl ethyl ketone.

Values found for the specific rotation of gliadin were 1 or 2° lower than most reported in the literature. The specific rotations in ethyl alcohol-water solutions of 70, 60, and 50 per cent concentration were $[\alpha]^{20}_{D}=-89.8$, -91, and $-90.3°$, respectively. These values were considerably increased by increases in temperature. The specific rotation of gliadin in *n*-propyl alcohol-water at 20° C. averaged −98.2° and in a 30 per cent aqueous urea solution −116.5°.

The chemical composition of the Bitonto type of Italian olive oil, W. F. BAUGHMAN and G. S. JAMIESON (*Jour. Oil and Fat Indus., 2 (1925), No. 4, pp. 110, 111*).—For comparison with previously reported data on the composition of California olive oil (E. S. R., 54, p. 110), similar data were obtained for Italian olive oil of the Bitonto type as follows: Glycerides of oleic 83.1, linolic 3.9, myristic trace, palmitic 9.2, stearic 2, and arachidic acid 0.2, and unsaponifiable matter 1.1 per cent. The greatest difference in the composition of the two oils was in the percentage of glycerides of palmitic acid, the Italian oil containing 2.3 per cent more than the California oil.

Some analyses of commercial corn sirups, C. P. LATHROP (*Jour. Assoc. Off. Agr. Chem., 8 (1925), No. 6, pp. 714, 715*).—Analyses of nine samples of commercial corn sirup such as used in the manufacture of jellies and jams

are reported with the following average results: Moisture by refractometer, 17.75 per cent; moisture by vacuo drying at 70° C., 18.94; sugars before inversion as glucose, 35.65; sugars after inversion, 36.28; sugar after 2.5 hours boiling in dilute HCl, 81.4; total ash, 0.321; sulfur in ash, 3.31; P_2O_5 in ash, 23.4; K_2O in ash, 2.04; and Cl in ash, 22.05 per cent. Polarization values of the normal solution were, before inversion 20°+171.4, after inversion 20°+169.4, and after inversion 87°+159.

Studies on the ultrafiltration and electrodialysis of insulin solutions, T. C. TAYLOR, C. E. BRAUN, and E. L. SCOTT (*Amer. Jour. Physiol., 74 (1925), No. 3, pp. 539–566, figs. 7*).—Attempts to separate and concentrate the active constituent in insulin by ultrafiltration and by electrodialysis are reported in detail, with the following conclusions:

The active constituent of insulin can be ultrafiltered through colloidal membranes of high and low permeability without loss of activity or change in the nitrogen content of the insulin.

From insulin solutions subjected to electrodialysis in a special type of electrolytic cell arranged to prevent contact of the insulin with the electrodes, a sediment can be deposited which is 100 per cent more active per unit weight injected than the original material. The filtrate after removal of this active sediment is but slightly active. The electrode at which the active material is deposited is determined by the H-ion concentration of the solution undergoing dialysis. If the solution is acid the material is deposited on the cathode and if alkaline on the anode. In acid solution the deposition takes place at a pH of about 3.6 whatever the initial H-ion concentration of the solution instead of at a pH of about 4.8, the isoelectric point of insulin.

The active sediment is soluble in both dilute acids and alkalies, is precipitable by phosphotungstic acid, and contains sulfur and nitrogen (14.52 per cent) but no phosphorus. The inactive material gives a protein reaction and contains neither sulfur nor phosphorus. From a solution of the active material in equal volumes of 25 per cent sulfuric acid and 95 per cent ethyl alcohol, an active micro-crystalline substance is formed, together with some inactive crystals resembling tyrosine.

The concentration of vitamin B, II, P. A. LEVENE and B. J. C. VAN DER HOEVEN (*Jour. Biol. Chem., 65 (1925), No. 2, pp. 483–489*).—In this continuation of the investigation previously noted (E. S. R., 51, p. 609) a further concentration of the Osborne and Wakeman yeast concentrate was effected, first, by introducing before the barium hydroxide precipitation a precipitation with basic lead acetate, with removal of the lead by sulfuric acid instead of by hydrogen sulfide, as has generally been the custom. On further precipitation with barium hydroxide, a product was obtained which was nearly as active as the one previously prepared by adsorption on silica gel. Quantities of from 2 to 4 mg., containing from 0.1 to 0.2 mg. of nitrogen (5.2 per cent on an ash-free basis), were sufficient for the usual feeding tests.

On precipitating the sulfuric acid extract of the barium precipitate with absolute alcohol from a strongly acid solution, pH 2, a substance was obtained which contained only 6.1 per cent of mineral impurities and no phosphorus and contained 40 per cent of carbon, 5.8 per cent of hydrogen, and 4.1 per cent of nitrogen. The substance gave a strong orcinol test and on hydrolysis reduced Fehling's solution. The minimum dose of this material was about 2.5 mg. daily, containing 0.1 mg. of nitrogen.

A still more potent material was obtained by dissolving the lead barium product in a small amount of hydrochloric acid, specific gravity 1.19, and adding to the solution enough 98 per cent alcohol to make the alcohol con-

centration 70 per cent. This contained about 4 per cent of nitrogen and was active in daily doses of 1.25 mg. On treatment with silica gel the material purified in these two ways was not as active as the material from which the phosphorus had not been removed, the minimum daily doses of the two being 0.6 and 0.1 mg., respectively. This is thought to indicate that the phosphorus-containing impurity is essential for selective adsorption by silica.

The electrodialysis of agar.—A method for the preparation of the free agar-acid, W. H. Hoffman and R. A. Gortner (*Jour. Biol. Chem., 65 (1925), No. 2, pp. 371–379*).—By subjecting commercial agar to electrodialysis for a period of 18 hours, using a total electric current of approximately 11.65 ampere hours at a potential of 220 volts, practically all of the calcium was removed but no sulfur. The free agar acid thus obtained had an H-ion concentration of pH 2.475 in 1 per cent solution and was neutralized by sodium hydroxide below pH 4. It is considered to be an acid sulfuric acid ester, in which all of the sulfur is in the form of sulfuric acid. The minimum molecular weight is calculated to be in the neighborhood of 3,000, corresponding to the formula $R\text{-O-SO}_2\text{-OH}$, in which R is a large polysaccharide residue.

The use of solvents in synthetic organic chemistry, D. W. MacArdle (*New York: D. Van Nostrand Co., 1925, pp. VII+217*).—This volume, which is planned as the first part of a treatise on the operative technique of synthetic organic chemistry, is a compilation from many sources of the literature on the subject. The scope of the work is indicated by the chapter headings, which are as follows: General considerations; inorganic solvents, organic solvents for inorganic salts; alcohols as solvents; the preparation of absolute alcohols; higher alcohols and ethers as solvents; organic acids, esters, ketones, and bases as solvents; hydrocarbons as solvents; inert liquids as solvents, solid diluents; special means of inducing crystallization; and salting out. The numbered citations in the text are assembled as a bibliography of over 900 references.

Distillation in practice, C. Elliott (*London: Ernest Benn, 1925, pp. 188, figs. 43*).—The first five chapters of this manual deal with the theory of fractional distillation, and are followed by a brief chapter on heat transfer, two on distillation apparatus, and chapters on the technical application of distillation processes to ethyl alcohol, petroleum, and coal tar.

New reduction methods in volumetric analysis, E. Knecht and E. Hibbert (*London and New York: Longmans, Green & Co., 1925, 2. ed., [rev. and enl.], pp. X+134, figs. 3*).—Part 1 of this monograph (E. S. R., 29, p. 203) deals with the preparation of titanous chloride solutions and the use of titanous salts as qualitative reducing agents, part 2 with the principles and reliability of methods employed in the use of titanous chloride as a reducing agent in the quantitative volumetric analysis of both inorganic and organic compounds, and part 3 with the practical application of these methods, illustrated by selected examples. Of particular interest are the sections dealing with the analysis of organic dyestuffs and the determination of the coloring matter in dyed cotton fabrics and of the degree of mercerization in cotton yarns.

A modification of the official Lindo-Gladding method for the determination of potash, C. M. Bible (*Jour. Assoc. Off. Agr. Chem., 8 (1925), No. 4, pp. 420–423*).—The modification described has for its chief purpose the removal of interfering phosphoric acid from the filtrate. This is accomplished after the extraction of the potash with boiling water and precipitation with ammonia and ammonium oxalate by adding sufficient powdered magnesium oxide

to precipitate all the phosphoric acid, cooling, making up to volume, filtering, and continuing as in the official Lindo-Gladding method. Data are reported showing that the modified method gives results averaging 0.19 per cent higher than the Official method but nearer the theoretical results.

Analysis of nonhomogeneous fertilizers [trans. title], E. ROUSSEAUX (*Ann. Falsif., 18 (1925), No. 195, p. 172*).—The errors resulting in the nitrogen determination of fertilizers if the samples are not homogeneous (E. S. R., 51, p. 804) are shown to extend to other determinations. As an illustration it is reported that determinations of the phosphoric acid content of green bone meal ground to three grades of fineness gave values of 9.9, 14.3, and 19.1 per cent, respectively, whereas the real content was 14.3 per cent. The precautions outlined in the previous paper are reiterated.

The manufacture and analysis of new urea-containing fertilizers manufactured from Cyanamid [trans title], A. COCHET (*Ann. Falsif., 18 (1925), Nos. 199–200, pp. 396–412; 201–202, pp. 468–476, fig. 1*).—A brief description is given of the chemical changes involved in the manufacture from calcium cyanamide of urea and of phosphazote, a superphosphate of urea in which the urea is in a complex combination with monocalcium phosphate. The methods employed by the author in the analysis of these fertilizers are then outlined. These consist essentially in the determination of urea by the xanthydrol method of Fosse, of guanylurea by the action of nickel salts, of ammoniacal nitrogen in the presence of the preceding bases, and of dicyanodiamide by direct determination. Each method is described as applied to the pure substance and to mixed fertilizers.

Report of the committee on methods, C. E. MANGELS ET AL. (*Cereal Chem., 2 (1925), No. 4, pp. 235–251*).—This report of the committee on methods of the American Association of Cereal Chemists consists of a general report covering the methods of determining moisture, ash, and protein in cereals, based upon information obtained from a questionnaire sent to the members of the association, a report by M. B. Warren on Collaborative Work on Protein in Cereals, and a report by J. C. Wood on Collaborative Work on Ash Methods.

Rapid valuation of flours by colorimetric drop tests [trans. title], P. BRUÈRE (*Ann. Falsif., 18 (1925), No. 195, pp. 161–165*).—As a rapid method of detecting samples of flour which have been kept too long or which have been treated with chlorine or mustard gas, the author suggests colorimetric drop tests with four indicators, bromophenol blue pH 4.6, methyl red pH 6, bromocresol violet pH 6.8, and bromothymol blue pH 6. The limiting range of H-ion concentration of flours of recent milling is placed at from pH 6 to 5.2, at which concentrations bromothymol blue changes from blue to yellow and methyl red from red to yellow, while bromophenol blue does not change. Flour which has aged or has been treated with chlorine or mustard gas has an H-ion concentration of about 4.6, at which bromophenol blue turns from blue through green to yellow.

Triers for sampling flour, H. E. ROETHE (*Jour. Assoc. Off. Agr. Chem., 8 (1925), No. 4, pp. 424–435, figs. 6*).—Three types of conical and two of tubular triers for sampling flours are described, with dimensional diagrams. All of the types are designed to remove proportional quantities of flour from the various zones of flour sacks, and thus do away with the errors resulting from the varying moisture content of flour in different parts of the sack.

A method for the rapid and accurate determination of fat in cacao products, H. A. LEPPER and H. C. WATERMAN (*Jour. Assoc. Off. Agr. Chem., 8 (1925), No. 6, pp. 705–713*).—Petroleum benzine redistilled at a temperature

below 60° C. is used for extracting the fat in the method described, which involves the use of the Knorr extraction tube. The technique of the determination is given in detail, with data on its accuracy. It is stated that in the proposed procedure four samples require scarcely more time than does one with the Official method, and that the method is quite as accurate.

The preparation of butter samples for analysis, L. C. Mitchell and S. Alfend (*Jour. Assoc. Off. Agr. Chem., 8 (1925), No. 5, pp. 574–585*).—This paper reports a critical study of the Official method for the preparation of butter samples for analysis, and a comparison of this method with the commercial method in which the sample is beaten to a creamy consistency by means of a spatula or other suitable instrument, and with a new stirrer method in which the sample is warmed in a Mason jar until about half melted and then stirred with a malted milk mixer for two or three minutes at a temperature of from 31 to 34° C. The new method is thought to give more uniform, accurate, and reliable results than either of the other two methods, as well as being considerably quicker.

Modified Kerr-Sorber method for unsaponifiable matter in fats and grease, R. Hertwig, G. S. Jamieson, W. F. Baughman, and L. H. Bailey (*Jour. Assoc. Off. Agr. Chem., 8 (1925), No. 4, pp. 439–442*).—A slight modification of the Kerr-Sorber method of separating unsaponifiable matter from fats and oils (E. S. R., 52, p. 712) is described, which is said to do away with the source of error involved in the original method in the extraction of a small quantity of fatty acids with the unsaponifiable matter. The modification consists essentialy in washing the soap out of the ether solution of the unsaponifiable matter with N/5 potassium hydroxide solution.

The quantitative determination of relative amounts of vitamin A, H. E. Munsell (*Diss., Columbia Univ., New York, 1924, pp. 29, figs. 4*).—In this more detailed report of the investigation previously noted (E. S. R., 54, p. 89), data are given on the vitamin A values of a number of foods in terms of (1) the amounts required daily to induce a gain of about 25 gm. in young rats in 8 weeks, (2) the relative values obtained by letting 1 represent the vitamin A content of a food when 1 gm. per rat per day induces a gain of 25 gm. in 8 weeks, and (3) the relative values on the basis of butter as 100. The last named values are as follows: Apple 1, banana 1, green string beans 6.6 to 7.4, butter 100, carrots 40 to 50, egg yolk 100, egg white 0, lettuce 2.8 to 3.2, whole milk powder 22.2, whole milk 2.6 to 3.8, orange juice 1.4, baked white potato 0.42, fresh spinach 112 to 118, fresh tomato (summer or winter) 8, and canned tomato 9.

METEOROLOGY

Measuring the sun's heat and forecasting the weather, C. G. Abbot (*Natl. Geogr. Mag., 49 (1926), No. 1, pp. 111–126, figs. 16*).—This is a popular account of past and proposed work of the Smithsonian Institution on measurement of variation in solar radiation, with some reference to the use of the data in weather forecasting. Attention is called especially to the provision by the National Geographic Society for additional observation stations.

[Forecasting seasonal precipitation in the western United States] (*Bul. Amer. Met. Soc., 6 (1925), No. 12, pp. 179–181*).—Abstracts are given of several papers dealing with this subject from the points of view of the hydroelectric company by A. Wilstam, the irrigation engineer by E. A. Rowe, the agriculturist by J. G. France, and the forester by J. E. Elliott. The possibility of correlating the summer ocean temperature with the rainfall of the following season is indicated.

Climatological data for the United States by sections [September–October, 1925] (*U. S. Dept. Agr., Weather Bur. Climat. Data, 12 (1925), Nos. 9, pp. [189], pls. 5, fig. 1; 10, pp. [190], pls. 3, fig 1*).—These numbers contain brief summaries and detailed tabular statements of climatological data for each State for September and October, 1925.

Meteorological tables, D. A. SEELEY (*Mich. State Bd. Agr. Ann. Rpt. Sec., 63 (1924), pp. 133–145*).—Daily and monthly summaries of temperature (maximum, minimum, and mean), precipitation, cloudiness, and sunshine, and monthly summaries of pressure (maximum, minimum, and mean), wind movement, and miscellaneous pheuomena (frost, hail, thunderstorms, fog, auroras, and halos) at Lansing, Mich., are given for the year ended June 30, 1924.

Climate of British Columbia, F. N. DENISON (*Brit. Columbia Dept. Agr. Bul. 27, 10. ed. (1925), pp. 24*).—This, the tenth edition of this bulletin, brings the record of temperature, precipitation, sunshine, and relative humidity of the Province up to the end of 1924. The year was one of remarkable extremes. "The summer was unusually dry and hot, causing destructive forest fires, and in southern Kootenay the temperature exceeded 100° [F.] on five days and reached a maximum of 109°. Heavy rains occurred in September, causing floods on the lower mainland. October and November were abnormally mild, followed in December by one of the most prolonged and coldest spells on record."

Oceanic and climatic phenomena along the west coast of South America during 1925, R. C. MURPHY (*Geogr. Rev., 16 (1926), No. 1, pp. 26–54, figs. 16*).—This is an account of observations by the author on a remarkable change during the winter and spring of 1925 of the customary weather of the arid west coast of South America due to reversals of the ocean currents, resulting in abnormally high temperatures of the sea water and torrential rains which did serious economic damage.

Is rain water a nitrogen fertilizer? [trans. title], V. ILKOV (W. JLKOV) (*Spis. Zeml. Izp. Inst. B''lgariiā. (Rev. Insts. Recherches Agron. Bulgarie), 3 (1925), No. 4–6, pp. 325–338*).—From results of analyses of rain and melted snow during three years, the author concludes that on the average the soil received annually 1,186.19 gm. per decare (10.5 lbs. per acre) of nitrogen in the form of ammonia and 69 gm. in the form of nitric acid. No relation was established between the quantity of ammonia in the rain water and the temperature of the air. Nitric acid was found in larger amounts in the rain water during summer than in the melted snow of winter, this being attributed to the action of lightning in summer. Dew and frost were found to contain nitrogen compounds, but it was not possible to determine the amount because of the impossibility of collecting sufficient amounts for analysis. Making an allowance for various possible losses it is concluded that the soil actually received somewhat less nitrogen than the average amount given above.

SOILS—FERTILIZERS

[Soils studies at the Porto Rico Station], J. O. CARRERO (*Porto Rico Sta. Rpt. 1924, pp. 8–10*).—Data on the management of cane soils are briefly reported, no conclusions being drawn.

Preliminary experiments with sulfur and sulfur-carrying materials failed to indicate any increase in plant growth due to added sulfur on Porto Rican soils. In comparative tests made on a red clay soil, with and without the addition of lime, native bat guano was found to contain enough sulfur in soluble form to more than satisfy the needs of the plants. In a second test sulfur

failed to produce any increase in yield, regardless of whether the soil was limed or unlimed when nitrogen and potash were the fertilizers added. Calcium sulfate failed to bring about any increase in yield in the unlimed pots, but doubled it in the limed pots.

When phosphoric acid was used with nitrogen and potash the addition of calcium sulfate always produced an increase in yield, the limed pots producing the largest increases. When no sulfur was used the yield of the limed pots was below that of the unlimed pots. However, the addition of calcium sulfate to the limed pots produced a yield which fairly equaled that in the unlimed pots.

[Soil studies at the Michigan Station], M. M. McCool et al. (*Michigan Sta. Rpt. 1924, pp. 232–242*).—Data on soil surveys and soil fertility experiments are briefly summarized, special reference being made to work on muck soils. It is noted that generally when the water level averages a depth of 4 or more feet during the growing season lower crop yields are secured on muck than when it is at a less depth. For most crops a water level averaging around 3 ft. has been found to give the best results, while for some, notably celery, a lesser depth will produce higher yields. The results indicate further that in general the cereal crops are not well adapted to muck.

Studies of soil physics by J. G. Bouyoucos have shown that the barometric changes down to great depths are the same as those at the surface, and that air-barometric pressure changes have a more important influence on soil aeration than has been commonly assumed. Soil granulation studies have indicated that water is the most important factor in soil granulation, but in a different manner from that commonly assumed. Soil activity studies, while incomplete, seem to indicate that the marked differences in the physical reactivity of different soils are due to the nature of the surface of their particles, whether porous, rough, or vitrified, and to the degree of decomposition.

In studies by C. H. Spurway on the residual effects of neutral salt treatments on soils, the residual effect of neutral calcium and magnesium salts seemed to have little influence in changing the soil reaction, while neutral salts of sodium and potassium made the soil more alkaline or less acid, depending on the reaction of the natural untreated soil. The magnitude of these reaction changes depends somewhat upon the amount of basic exchange between the soils and the neutral salts applied. Other experiments indicate a relationship between soil reaction and the solubility of soil constituents, particularly the basic portions of soils.

What the Illinois farmer can do to learn about his soils, E. E. DeTurk (*Illinois Sta. Circ. 302 (1925), pp. 8, figs. 4*).—The purpose of this circular is to tell Illinois farmers how they can learn many facts about the needs of the soil on their farms by studying the soil themselves, and how the experiment station can help them in securing information.

The help of graphs in Kopecky's scale for soil classification by mechanical analysis, J. Spirhanzl (*Internatl. Rev. Sci. and Pract. Agr. [Rome], n. ser., 3 (1925), No. 1, pp. 121–123, fig. 1*).—These data are graphically presented, permitting the immediate description of the soil type desired.

Soil survey of Floyd County, Iowa, A. M. O'Neal and A. W. Goke (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1922, pp. III+439–477, fig. 1, map 1*).—This survey, made in cooperation with the Iowa Experiment Station, deals with the soils of an area of 316,800 acres in northeastern Iowa. The topography varies from almost level to strongly rolling. Drainage is said to be adequate over the greater part of the county. It is not well established, however, on the broader divides where the surface is flat to gently undulating.

The area lies within the boundaries of the Iowan drift sheet, and, excepting those areas where the drift has been removed and that section where the till has been covered by a mantle of silty material, the soils have been formed by the weathering of the glacial drift. Including meadow and peat and muck, 25 soil types of 15 series are mapped, of which the Carrington and Clyde silt loams cover 51 and 14.2 per cent of the area, respectively.

Soil survey of Jefferson County, Iowa, C. L. Orrben and C. B. Boatwright (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1922, pp. III+307–343, fig. 1, map 1*).—This survey, made in cooperation with the Iowa Experiment Station, deals with the soils of an area of 275,840 acres lying in the loess area of southeastern Iowa. The topography is that of an old drift plain which has been covered by a mantle of wind-blown material and later modified by stream erosion. The Skunk River and its tributaries drain 90 per cent of the county, and the remaining 10 per cent is drained by tributaries of the Des Moines River. Nineteen soil types of 13 series are mapped, of which the Grundy and Clinton silt loams cover 45.5 and 32.8 per cent of the area, respectively.

Soil survey of Washington Parish, Louisiana, A. C. Anderson et al. (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1922, pp. III+345–390, fig. 1, map 1*).—This survey deals with the soils of an area of 419,200 acres in the northeast corner of the eastwardly projecting southern half of Louisiana. There are three general types of topography within the parish, including the uplands or the Coastal Plains, the high river and late marine terraces, and the recent alluvial land. The uplands are largely gently rolling but vary from nearly level to rough and hilly. All of the area lies within the Pearl River drainage basin except the southwestern part. Most of the upland has excessive rather than deficient drainage. As a whole the stream bottoms are rather swampy.

The soils are characteristic of the Coastal Plain. Including muck, 37 soil types of 15 series are mapped, of which the Ruston and Orangeburg fine sandy loams cover 24.2 and 11.8 per cent of the area, respectively.

Soils of Roosevelt County, L. F. Gieseker (*Montana Sta. Bul. 179 (1925), pp. 43, pls. 4*).—The results of a reconnaissance survey, made in cooperation with the U. S. D. A. Bureau of Soils, of an area of 1,507,200 acres lying in the glaciated portion of the Great Plains area of eastern Montana is reported. The more prominent physical features of the county are the high plateaus with more or less gravelly and eroded slopes, the terminal moraines, the valley benches, and the bad lands and breaks along the larger streams. It is stated that 6 per cent of the soils have been derived from ancient stream deposits, 13.5 per cent from recent stream deposits, and 0.2 per cent from sand dunes. The soils from ground and terminal moraines together with the associated stream deposits cover 74 per cent and the residual soils 5.5 per cent of the area. The soils derived from ancient stream and glacial deposits are said to be the more important and productive in the county.

Soil survey of Dawson County, Nebraska, F. A. Hayes et al. (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1922, pp. III+391–438, fig. 1, map 1*).—This survey, made in cooperation with the University of Nebraska, deals with the soils of an area of 630,400 acres lying in the loess region in south-central Nebraska. It includes about equal parts of the small loess plains and canyon area and the Platte Plain area. The topography of the uplands ranges from rough and hilly to almost flat, while that of the alluvial lands is flat to gently undulating. The county as a whole is well drained.

The soils have been developed under a grass vegetation and under climatic conditions that were favorable for the accumulation of large quantities of organic matter. Including riverwash, 21 soil types of 8 series are mapped,

of which the Colby and Hall silt loams and the Hall very fine sandy loam cover 34.7, 19.2, and 16.7 per cent of the area, respectively.

The mineralogical composition of some Scottish soils, J. HENDRICK and G. NEWLANDS (*Jour. Agr. Sci.* [*England*], *15* (*1925*), *No. 3, pp. 257–271*).—In a further contribution to the subject from the North of Scotland College of Agriculture (E. S. R., 50, p. 418), a more extensive survey of Scottish soils is reported, the purpose of which was to determine to what extent the preliminary findings might be generally applicable. Mechanical and mineralogical examinations of samples of soil collected from various localities in the north, northeast, west, and south of Scotland are reported in this connection.

All of these soils, with the exception of those from the south of Scotland, were found to be characterized by a relatively high proportion of unweathered material, and even the soils from the south contained a considerable amount. The soils varied considerably in mineral content, and could be classified on the basis of the predominant silicates present and further graded according to the composition of the ferrosilicate group. This classification grouped soils of similar geological origin together.

The soils were mainly drift soils, and the nature of the drift was almost invariably determined by the kind of rock which had been immediately traversed by the ice, so that on areas occupied by large formations the drift, and hence the soil, was similar in mineral composition to the underlying rock and overlap was found only at junctions of rock types. This is taken to indicate that a soil survey would be greatly facilitated by a knowledge of the solid geology.

The relation between the vapour pressure and water content of soils, A. N. PURI, E. M. CROWTHER, and B. A. KEEN (*Jour. Agr. Sci.* [*England*], *15* (*1925*), *No. 1, pp. 68–88, figs. 7*).—Studies conducted at the Rothamsted Experimental Station on the water contents of a characteristic series of soils when in equilibrium with atmospheres of different humidities are reported, two methods being used in the determinations.

Substantially the same equilibrium points were reached in vacuum desiccators as in an air stream, but the former method was found to be the more convenient. The water absorption at definite relative humidities was almost independent of temperature over the range from 20 to 40° C. for high relative humidities, but decreased markedly with increasing temperatures for the lower relative humidities. This influence of temperature on the relative vapor pressures of moist soils is considered to be connected with the fact that dry soils liberate heat when wetted. All soils were found to show considerable hysteresis in their vapor pressure relations. The apparent water content or loss on heating of a soil increased regularly with the temperature of heating up to about 200°. Soils heated to various temperatures between 100 and 200° showed substantially the same absorption of water at different relative humidities.

Water absorption by a soil was markedly affected by previous treatment with agents known to disintegrate the soil. The vapor pressure curves of the various soil fractions, including clay, differed only slightly in type from that of the soil, although the absolute amounts of water taken up increased with the increasing specific surfaces.

The dispersion of soil in water under various conditions, A. N. PURI and B. A. KEEN (*Jour. Agr. Sci.* [*England*], *15* (*1925*), *No. 2, pp. 147–161, figs. 7*).—Studies conducted at the Rothamsted Experimental Station of the intensity of the forces binding soil particles together when the soil has been previously subjected to treatments simulating varying field conditions are reported. The technique adopted consisted in shaking soil with water under reproducible

conditions, allowing the mixture to stand for 24 hours, and then determining the concentration of soil in the top 8.5 cm. of the suspension. This concentration was expressed as a percentage of the original concentration of the soil, and the value thus obtained was called the dispersion factor of the soil under the given conditions of the treatment.

It was found that disintegration of soil aggregates by shaking in water proceeds continuously, rapidly at first and then more slowly. After nearly 100 hours of shaking, the dispersion factor is still slowly increasing, and its change with time after the first rapid increase is completed can be expressed by the equation $d=a+K \log t$, in which d equals the dispersion factor, t the time of shaking, and a and K are constants.

The dispersion factor was found to depend on the original concentration of the soil. There were slight but systematic changes in the lower concentrations, and when a certain maximum concentration was passed flocculation occurred. It is considered probable that, in addition to the increase in concentration, the concomitant increase in the amount of soluble salts present is concerned in the flocculation process. The dispersion factor for clay decreased continuously with decrease in initial moisture content, whereas with soil a stationary value was reached when the moisture content was reduced to a certain value. Contact with water or water vapor broke up soil aggregates only very slowly.

A progressive decrease in the dispersion factor was caused by heating the soil to temperatures over 110° C. (230° F.), but up to this temperature no reduction appeared. In the case of clay, heating to 100° greatly reduced the dispersion factor. The influence of electrolytes was progressive and gradual and not a sharp flocculation or deflocculation. With good deflocculants, as the concentration was increased the dispersion factor increased to a maximum, decreased slowly, and then rapidly until complete flocculation occurred.

A comparison of various methods recommended for soil dispersion showed that the use of a rubber pestle is one of the most efficient.

A note on the availability of organic nitrogen compounds in pot experiments, E. M. Crowther (*Jour. Agr. Sci.* [*England*], *15* (*1925*), *No. 3, pp. 300–302*).—In connection with an investigation at the Rothamsted Experimental Station on nitrification in soils, a series of pot experiments was conducted to compare the manurial actions of 17 typical organic nitrogen compounds. The results of the pot experiments are briefly reported.

A critical study of the hygroscopic coefficient of soil, A. N. Puri (*Jour. Agr. Sci.* [*England*], *15* (*1925*), *No. 3, pp. 272–283, figs. 3*).—Studies conducted at the Rothamsted Experimental Station on the hygroscopic coefficient of soil at five temperatures, ranging from 15 to 35.6° C. (59 to 96° F.), are reported.

It was found that the customary period of from 12 to 24 hours used by previous workers is much too short to give any approach to final values. At the lower temperatures, all except the very light soils continued to take up water almost indefinitely, and it was not possible to extrapolate to an approximate final value. These final values decreased with increasing temperature, but in the early stages the rate of moisture absorption increased with increasing temperature.

The conclusion is drawn that the hygroscopic coefficient can not be satisfactorily determined even when the technique is refined considerably beyond that reasonably possible in routine determinations. This conclusion is supported by the results of vapor pressure determinations of moist soil and by a consideration of the manner in which colloidal material of a reticulate struc-

ture takes up water vapor. It is suggested that a measurement of the moisture content of soil in equilibrium with an atmosphere of 50 per cent relative humidity should replace the hygroscopic coefficient. The proposed determination can be quickly and accurately made, and is only slightly affected by temperature changes. It has the further advantage in that it corresponds closely to a definite point on the vapor pressure curve, the point of inflection.

A fundamental study of the mechanism of buffer action in soils, P. B. Myers and G. L. Baker (*Delaware Sta. Bul. 141 (1925), pp. 13, 14*).—It was found that on electrometric titration with an acid and a base sand soil exhibited a very slight buffer action, while clay and muck were highly buffered. Ignition of soil samples, followed by titration with an acid and an alkali, showed that in all cases the initial pH of the samples increased with the temperature, due probably to the destruction of an organic acid or the conversion of metals to oxides or carbonates. The buffer action decreased with increased temperature, and very little buffer action was noticeable at a high temperature (about 850° C.).

The buffering power of Norfolk sand was almost completely destroyed at a medium temperature of about 450°. This is taken to indicate that the small amount of buffer action of sand is due mostly to organic matter, which is destroyed at the medium temperature. The change in buffering power due to heating was more gradual with loam and silt loam soils. The medium temperature was sufficient to completely destroy the organic matter in these soils, but had little effect on the inorganic colloidal material.

Some experiments on the interaction between soil and dilute acids, A. N. Puri (*Jour. Agr. Sci. [England], 15 (1925), No. 3, pp. 334–342, figs. 4*).—Studies conducted at the Rothamsted Experimental Station are reported which showed that, under the experimental conditions employed, soil removes chlorine ions from dilute hydrochloric acid. Hydrochloric, nitric, sulfuric, acetic, citric, and phosphoric acids were found to react with soil, and the state of equilibrium between the soil and the acid solution could be satisfactorily expressed by Freundlich's equation. The order of reactivity of the soil toward various acids did not follow any obvious rule.

The various soil fractions did not show any fundamental difference in their equilibrium relationship with regard to an acid solution, the order of their power to react with acid following inversely the order of the size of particles in them. These results seemed to support the view that the interaction between soil and acids is a surface phenomenon.

The influence of neutral salts on soil reaction, O. Arrhenius (*Internatl. Rev. Sci. and Pract. Agr. [Rome], n. ser., 3 (1925), No. 1, pp. 123–133, figs. 3*).—Studies are reported which showed that neutral salt solutions exercise an acidifying influence. Ordinary artificial fertilizers were found to exert very little influence in the matter of modifying reactions, although large additions may have an unfavorable effect on soil reaction. It is considered apparent that the estimation of soil reactions in salt solutions is an unsatisfactory method.

The aluminum content of the soil solution and its relation to soil reaction and plant growth, O. C. Magistad (*Soil Sci., 20 (1925), No. 3, pp. 181–225, figs. 16*).—Studies conducted at the University of Wisconsin on the amount of aluminum present in the solution of soils of different reactions and on the action of aluminum on plant growth in relation to reaction are reported. These included studies of the solubility of aluminum compounds in water, nutrient solutions, and soil solutions at various reactions, and greenhouse tests with aluminum on barley, rye, alfalfa, red clover, corn, oats, and soy beans.

It was found that the curve for the solubility of aluminum in the soil solution at various reactions practically coincides with the curve for the solubility of aluminum in water at the same reactions. As the acidity of soil solutions decreased to the neutral point, the solubility of the aluminum decreased to almost nothing. When the acidity became greater than pH 5 the aluminum solubility increased rather rapidly until pH 4.5 was reached, at which point it increased very rapidly.

At very strong acidities—that is, greater than pH 5—all of the crops except alfalfa suffered both strong aluminum toxicity and strong H-ion toxicity. At these strong acidities the alfalfa died whether aluminum was added or not. At acidities less than pH 5 alfalfa, red clover, rye, and oats suffered little or no aluminum toxicity, while corn, barley, and soy beans suffered appreciably. Alfalfa and red clover suffered greatly from H-ion toxicity, while barley, corn, oats, and rye suffered much less, but still appreciably, and soy beans little or none at all.

These results are taken to indicate that the benefit resulting from the use of lime in the case of clover, alfalfa, oats, and rye is usually due to a decrease in acidity and not to a decrease in soluble aluminum present. In the case of corn and barley over the same range of acidity, this benefit results from a decrease in both acidity and soluble aluminum. In the case of soy beans the benefit is apparently due more to a decrease in soluble aluminum. In the case of soils more acid than pH 5, the benefit of liming to all crops studied appeared to come almost equally from a decrease in acidity and soluble aluminum present.

Strongly alkaline soils were found to contain large amounts of soluble aluminum, and this is taken as one of the reasons why very alkaline soils do not support good plant growth. When grown in cultures to which aluminum had been added, the percentage of aluminum in plants increased, while that of iron decreased, indicating a possibility that aluminum was displacing iron. Aluminum in water cultures was found to prevent the formation of lateral rootlets on barley but not on rye. In the case of rye, however, the lateral root development was restricted by aluminum.

[Soil bacteriological studies at the Delaware Station], T. F. MANNS (*Delaware Sta. Bul. 141 (1925), p. 30*).—Studies of the flora of a so-called pox-sick soil showed that the Actinomycete causing this condition was present to the extent of over 100,000 cultures per gram of soil. It was found to grow much slower than other Actinomycetes, and in properly diluted cultures it could be brought out by Ashby's medium.

High-grade muck is reported to be a very favorable medium for sulfur oxidation. In one compost more than 50 per cent of the phosphorus became citrate soluble in 12 weeks, and in 30 weeks 85 per cent became soluble.

Soil flora studies.—VI, The punctiform-colony-forming bacteria in soil, H. J. CONN (*New York State Sta. Tech. Bul. 115 (1925), pp. 3–26*).—In a sixth contribution to the subject (E. S. R., 37, pp. 516, 517), the results of a preliminary survey of a group of soil bacteria which do not produce endospores and which are characterized by the formation of punctiform colonies on gelatin or agar plates are reported. It was possible to classify these organisms into five morphologically different groups, only two of which are considered in detail.

The first of these groups consists of simple short rods that show no appreciable change in morphology under ordinary laboratory conditions. Out of about 300 cultures, 96 were found to fall in this group. These cultures varied greatly from one another in respect to all the physiological tests to which they were submitted.

The second group consists of organisms which grow as short rods for a day or two in a fresh culture, but subsequently appear as spherical coccus-like cells. Seventy-six of the cultures studied fell into this group. These coccus-forming rods proved to be much less diverse in physiology than the simple rods, 70 of the 76 cultures falling into two physiological types. These two types seemed to be fairly constant and distinct.

It is felt that the occurrence of these coccus-forming rods in the soil may account for the fact that a microscopic examination of untreated field soil ordinarily shows nothing but coccus-like organisms, whereas rods appear as soon as any special treatment is given to the soil.

The micro-organisms of the soil (*Rothamsted Expt. Sta., Harpenden, Rpt. 1923–1924, pp. 31, 32*).—It is stated that the most striking result brought out by recent observations has been the fluctuation of soil microorganisms under natural field conditions. There are two-hourly fluctuations, recognized at present only in the case of bacteria. Superimposed upon these are daily fluctuations, which are known to affect not only bacteria but protozoa also. There are also seasonal fluctuations, bacteria, protozoa, and apparently also algae and fungi being affected. The cause of the daily and probably of the hourly fluctuations of bacteria is attributed to the fluctuation of the number of the amebas which feed upon them.

Data on the number and weight of bacteria and protozoa in soil indicate that the weight of the protozoa considerably exceeds that of the bacteria, in spite of the high numbers of the latter. It is stated further that definite evidence is available that crops obtain only part of the possible nutrient supply, and that much of the remainder is taken by soil organisms and thus rendered unavailable.

The nitrate question in Colorado: A review for the farmer, W. P. Headden (*Colorado Sta. Bul. 299 (1925), pp. 3–27*).—This is a popular review of the results of work conducted by the station for several years on the soil nitrate question, reports of which have been noted from time to time in the *Record*.

Further experiments on the effect of removing the soluble humus from a soil on its productiveness, E. M. Crowther (*Jour. Agr. Sci. [England], 15 (1925), No. 3, pp. 303–306, fig. 1*).—Further studies at the Rothamsted Experimental Station on the effect of the removal of soluble humus from a soil showed that alkaline extraction of the humus from both a garden and a field soil reduced the productiveness of a series of crops in pot experiments. The field soil showed an initial but temporary increase in productiveness.

The effect of straw on plant growth, R. C. Collison and H. J. Conn (*New York State Sta. Tech. Bul. 114 (1925), pp. 3–35, pl. 1, fig. 1*).—The results of greenhouse and laboratory cultures and of chemical analyses are reported which indicate that the harmful effect of straw and other plant residues when incorporated with the soil is quite complicated and can not be ascribed to one cause alone. There are apparently two different factors involved which may be separated by proper methods. One of these factors shows its effects very early in the growth of the plants, often during germination. The other factor does not have any influence until considerably later in the growth of the plants when they are drawing heavily upon the nutrients in the growth medium.

Apparently only the second of these two factors can be accounted for by the explanation that the presence of highly carbonaceous material stimulates the activities of microorganisms which compete with the plants for the available nitrogen and in that way cause a nitrogen shortage in the medium. Very

good evidence was found that this explanation is correct, although direct proof was not obtained. It is considered especially significant that the addition of straw has the same effect as that obtained by depriving a plant of a certain portion of its nitrogen supply, and that it can be overcome by adding more nitrogen. It is considered impossible, nevertheless, to account for that part of the detrimental effect of straw which was observed during the very early stages of plant growth before any nitrogen shortage could possibly have occurred.

This early effect was not noticed in the clay loam soil used, but was readily observed when the plants were grown in quartz sand or in water or agar cultures under laboratory conditions. The extent to which this factor operates is evidently inversely proportional to the amount of colloidal matter present. It has been apparently quite definitely established that there is some harmful chemical compound present in the plant residues.

The fact that chemical analysis indicated the presence of salicylic acid, dihydroxystearic acid, and occasionally vanillin, in the residues of various plants suggested that these known toxic compounds may be the cause of the harmful effects of straw observed during the early stages of plant growth.

Soil tilth and cultivation (*Rothamsted Expt. Sta., Harpenden, Rpt. 1923–1924, pp. 28–30, fig. 1*).—The results of the soil tilth and cultivation studies in progress at the station indicate that many of the observed properties of soils can be interpreted on the assumption that the colloidal material is permeated with minute capillaries, and that compound particles are formed in soil at comparatively high moisture contents which are not easily disintegrated when once formed. In connection with the latter finding it has also been found that complete dispersion of soil is frequently not attained in the standard method of mechanical analysis, and that therefore many of the recorded data are erroneous.

In studies of the moisture relationships of soil, measurements conducted in large cylinders filled with Rothamsted soil showed that little water rises to the surface from the subsoil when the ground water falls to 4 or more feet below the surface. A definite relation was found between the potential evaporating power at the surface and the change in ground water level.

The influence of grain growing on the nitrogen and organic matter content of the western prairie soils of Canada, F. T. Shutt (*Jour. Agr. Sci. [England], 15 (1925), No. 2, pp. 162–177, fig. 1*).—In a contribution from the Dominion Experimental Farms, Ottawa, Canada, studies are reported which indicate that grain growing as at present practiced with its necessary summer fallowing is destructive of soil organic matter, with a concomitant loss of nitrogen. Certain of the data indicate a slowing down in the rate of this destructive process, and it is considered probable that under the existing climatic conditions following an initial period of cultivation a point will be reached at which the dissipation, though not negligible, will be comparatively slight. It is the virgin soil, with its exceptional richness in organic matter, rather than the older cultivated soils which shows an excessive rate of deterioration.

It is concluded that exclusive grain growing must give way to a practice which introduces grasses and clovers in a rotation if the humus and nitrogen content is to be maintained and the binding element of the soil preserved. The systematic and periodic putting of the land in sod will serve to maintain the nitrogen and humus supply, to preserve good tilth and moisture-holding

capacity of the soil, and to arrest to a large degree the loss of valuable soil by drifting.

Rotations and fertilizers (*South Carolina Sta. Rpt. 1925, pp. 87–89*).—Experiments conducted for 12 years on 180 $\frac{1}{40}$-acre plats with a 3-year rotation of cotton, corn, and small grain, and with cotton grown continuously, are reported to have shown that potash gave an increase in yield up to 3 per cent when used in combination with 8 per cent phosphorus and 4 per cent ammonia in the 3-year rotation series. In the series where cotton was planted continuously 4 per cent of potash was required. In the rotation series nitrogen gave an increase in yield up to 5 per cent, and in the series where cotton was planted continuously nitrogen increased the yield up to 6 per cent. Phosphorus in a complete fertilizer increased both the yield and the earliness when applied at varying amounts up to 8 per cent. Sodium nitrate was found to be the best source of nitrogen, although time and manner of application of the different materials is apparently a deciding factor.

[**Fertilizer suggestions for Michigan County soils**], M. M. McCool and J. O. Veatch (*Michigan Sta. Circs. 72–83 (1925), pp. 8, fig. 1, each*).—Practical information on the subject is given for Berrien, Cass, Hillsdale, Ingham, Isabella, Kalamazoo, Livingston, Macomb, Muskegon, Ottawa, St. Joseph, and Van Buren Counties.

Basic slags and mineral phosphates, E. Vanstone (*Jour. Agr. Sci.* [*England*], *15 (1925), No. 1, pp. 36–46, figs. 2*).—Studies conducted at the Seale-Hayne Agricultural College on the relationship between the phosphoric acid soluble in 2 per cent citric acid and the total phosphoric acid present in basic slags, mineral phosphates, and phosphates of known composition are reported.

The relationship is shown graphically, and in nearly all the cases studied, was a straight line passing through the origin. For each of three basic slags of widely differing solubility in citric acid, the graph was a straight line. This is taken to indicate that solubility in citric acid is a definite constant, independent of the weight taken in the test, when allowance is made for a small constant error in the determination. The ratio of soluble phosphate to total phosphate in the case of the mineral phosphates Gafsa, Ephos, Nauru, and a West Indian phosphate was found to depend on the weight taken in the test, and the graphs were not straight lines.

Experiments with beans indicated that the assimilation of phosphoric acid from basic slags is directly proportional to the solubility of the phosphate in citric acid.

AGRICULTURAL BOTANY

Summary of literature on some phases of the effect of light on plant growth, H. W. Popp (*Illum. Engin. Soc. Trans., 19 (1924), No. 10, pp. 981–994*).—A brief review is given of the development, results, and bearings of investigations as to the influence of the light factor on plant growth, here including enlargement, differentiation, and reproduction. The limitations, with resulting imperfections, of past work are pointed out, and an outline is given of factors which, it is stated, must be measured, or as far as possible controlled and recorded.

Work to date at Boyce Thompson Institute for Plant Research on effect of light on plant growth, J. M. Arthur (*Illum. Engin. Soc. Trans., 19 (1924), No. 10, pp. 995–997*).—This paper reports the results of two experimental series with plants grown under illumination by 25 lamps of 1,000 watts each, with R. L. M. reflectors, humidity about 80 per cent, and temperature about 78° F. The resulting light intensity for the first series was about 400 foot-candles,

and for the second about 300 foot-candles at the soil level, the lamps being placed about 106 in. above that level. A ray filter (glass plate and 0.5 in. water) was placed 41 in. below the lamps. Plants of the first series were grown under carbon dioxide admixtures ranging from 0.1 to 0.8 per cent of the total volume of air, those of the second series in ordinary air only. Exposures to light were continued for 5, 7, 12, 17, 19, and 24 hours daily.

It appears that many plants, including geranium, snapdragon, radish, sunflower, and sweet pea, bloom younger under artificial illumination than under the best greenhouse conditions. Aster blooms when young for a 7-hour day, when older for a 12-hour day, and when still older even for a 24-hour day.

With additional carbon dioxide tomato was advantaged as to growth by 5 hours, more by 7 hours, and usually still more by 12 hours of exposure to the light, but this plant was disadvantaged increasingly by the use of 17-, 19-, and 24-hour exposures. "Without additional carbon dioxide the control is always taller than either the 5- or 7-hour day tomatoes, but not equal in height to the 12-hour day. The 5-hour plant died without carbon dioxide in less than a month, while the 24-hour plant showed very poor growth."

A summary of work done to date shows that many plants bloom somewhat earlier and some increase in height and weight without ultra-violet rays.

Discussion of the work at Boyce Thompson Institute and its applications, W. CROCKER (*Illum. Engin. Soc. Trans., 19 (1924), No. 10, pp. 998, 999*).—Though the efficiency of artificial light as compared with sunlight is low and though plants are very inefficient in regard to energy transformation and storage rate, so that plant growing by means of artificial light is at present far from profitable commercially, it is thought that the information that is being obtained by such work in regard to plant production may prove to have wide bearings. It may become practicable to utilize daylight for the main energy supply to build up the mass of the plant, and supplementary artificial light to give the form effects desired. Possibly also, very weak light may be used to piece out daylight so as to induce long-day plants to bloom. It may be advantageous to use high intensity to supplement daylight in December and January. Removal of other limiting factors may condition large increases of yield.

Effect of variation in day length on growth of certain plants, T. B. MCCLELLAND (*Porto Rico Sta. Rpt. 1924, pp. 10, 11, 12, 13, figs. 3*).—A brief report is given of investigations on the response of a number of species of plants when exposed to daily periods of illumination corresponding with the shortest and longest day of the latitude of the station or with some modification in the daily period of illumination. Bermuda onions and radishes were favored in their growth and development when subjected to the long day, while *Tephrosia candida*, roselle, zinnia, poinsettia, Biloxi soy beans, and *Tithonia rotundifolia* flowered and matured seed quickest under the short-day illumination.

Influence of colored light on plant growth, S. G. HIBBEN (*Illum. Engin. Soc. Trans., 19 (1924), No. 10, pp. 1000–1010, pls. 6, figs. 6*).—In this paper the author reports, with discussion, mainly the results of trials to find what region of the spectrum exerts the greatest influence on plant development. Several varieties of flowers and of vegetables were kept in darkness or in different light intensities and wave lengths (mostly from 350 to 750 millimicrons) and under different temperatures.

"One series of tests indicates that constant regulated artificial light alone produces better growth than does the changeable daylight of early spring, when considering natural seasonal development of bulb plants. A second

series of tests indicates that within the limits of practical control the unmodified light of the incandescent electric lamp is better than such light deficient in long-wave radiations below perhaps 550 millimicrons. Absence of short-wave radiations, above perhaps 450, seems to have no deleterious effects upon size of plant development."

Stimulation of plant growth by means of electric lighting, V. A. TIEDJENS (*Illum. Engin. Soc. Trans., 19 (1924), No. 10, pp. 1011–1019, pls. 4*).—It is claimed that electric light stimulation with type C Mazda lamps increases growth, hastens maturity, and promotes reproduction. Temperature appears also to be a factor in electric stimulation. Lettuce was stimulated to seed production in a short time, very low intensities being effective. More needs to be known regarding the internal effects of electric stimulation. The cost element will determine applicability.

Preliminary note on the cells of Vicia faba modified by Röntgen rays and their resemblance to tumor cells [trans. title], H. KOMURO (*Bot. Mag.* [Tokyo], *36 (1922), Nos. 424, pp. 41–45 (Eng. trans.); 425, pp. (97)–(101); abs. in Japan. Jour. Bot., 1 (1923), No. 3, pp. (37), (38)*).—It is stated that exposure to strong X-rays of *V. faba* seeds caused the cells of the young radicles to show a gradually progressive injury. This becomes evident at a certain stage of seedling growth after normal development (cell growth and division) up to a given point. The cells of the radicles as a consequence assume a diseased or senescent condition suggestive of tumor cells.

The cells of Vicia faba modified by Röntgen rays, and their resemblance to malignant tumor cells with the cytological observations of tumors, H. KOMURO (*Japan. Jour. Bot., 2 (1924), No. 3, pp. 133–156, pls. 2, figs. 12*).—Since the appearance of the preliminary account above noted, the author has carried forward certain phases of this work, which are indicated.

It is stated that X-rays cause the same cytological changes in *V. faba* in case of any race or treatment. Indications of degeneration include abnormal mitoses, irregular distribution of chromosomes, nuclear change as to form and content, separation of protoplast from cell wall, abnormal vacuolization, occurrence of excessive pigmentation, karyolysis, pycnosis, and the appearance of multinucleate cells.

In seedlings and young plantlets showing the more vigorous metabolism, degeneration was more rapid than in case of steeped seeds containing much water. Even in vigorously growing points of radicles, degenerative changes occurred in connection with prepycnosis. Cytological confirmation was obtained regarding facts indicated as previously noted.

Changes in malignant tumors are outlined, and it is claimed that X-ray irradiation of seeds, seedlings, and young plants of *V. faba* produce in cells of the vigorous growing point a diseased or senescent condition resembling malignant tumor and finally causing death of the cells.

Phototropic movements of leaves.—The functions of the lamina and the petiole with regard to the perception of the stimulus, N. G. BALL (*Roy. Dublin Soc. Sci. Proc., n. ser., 17 (1924), No. 35, pp. 281–286, figs. 2*).—The petiole of *Oxalis macra* is strongly phototropic, even after the removal of the lamina, though in this case the capacity for response is lost in a day or two.

A leaf of *Sparmannia africana*, if shaded so that a portion of the lamina is exposed to reduced illumination, shows a slow bending of the petiole, such that the direction of the motion is away from the shade and parallel to the suface of the lamina. The greatest bending occurs near the base of the petiole, the stimulus being transmitted through about 15 cm.

The petiole itself is phototropic, this enabling the leaf to adjust itself correctly under oblique illumination. The lamina can so adjust only when, owing to curvature of its surface, the intensity of the incident light is not uniform.

Variations of temperature in plants [trans. title], R. GAETANO (*Bul. Orto Bot. R. Univ. Napoli, 7 (1924), pp. 159–216, pl. 1*).—Plant organs show temperature variations which in general reach their maximum about the hours of greatest illumination.

[Report of the work in plant physiology of the Michigan Station], R. P. HIBBARD (*Michigan Sta. Rpt. 1924, pp. 204, 205*).—The principal investigation reported upon was a study of the influence of environmental factors on the physiological salt balance of growing plants. The plants were grown in solution cultures of different salt ratios under continuous light of different intensities for from four to five weeks, after which they were compared with greenhouse plants grown under normal day and night conditions. Continuous light of high intensity retarded the growth of tops and injured the roots, although the roots were not directly exposed to the light. A definite intensity of light, continuously applied at some distance from the plants, is said to have produced plants as vigorous as any grown under ideal greenhouse conditions.

Considering the salt relations, certain combinations gave better results than others. Seasonal variation was observed in the requirement of different salt ratios during one year, while during the second year's experiments the ratios, though not identical with those of the previous year, were within rather narrow limits.

Estimation of water economy of plants [trans. title], B. HUBER (*Jahrb. Wiss. Bot., 64 (1924), No. 1, pp. 1–120, figs. 4*).—Features and factors are presented, with discussion and extensive bibliography, in a comprehensive account of water economy in plants.

Variations in osmotic pressure of germinating seeds [trans. title], A. RONGIONE (*Bul. Orto Bot. R. Univ. Napoli, 7 (1924), pp. 134–158, figs. 5*).—In germinating seeds studied the ranges of osmotic pressure were found to lie between 19 and 27 atmospheres.

Variations in the permeability of leaf-cells, H. H. DIXON (*Roy. Dublin Soc. Sci. Proc., n. ser., 17 (1924), No. 45, pp. 349–356, figs. 7*).—The method, conditions, experimental data, and curve results are presented for the study of permeability variations in *Hedera helix* and *Syringa vulgaris*.

During sunshine, temperature differences between shaded and insolated leaf areas may amount to 10° C. or more. These temperature differences correlate positively with large local fluctuations in permeability. Such differences in permeability acting in concert with the hydrostatic tension throughout the plant furnish a mechanism for the distribution of dissolved substances through the plant body.

On the specific action of plant proteases, A. V. BLAGOVESCHENSKI (*Biochem. Jour., 18 (1924), No. 5, pp. 795–799*).—As a result of these preliminary experiments the author states that in all of the many cases brought under observation the ferment from every plant splits its own globulin more actively than those from other plants. The close systematic relation of Phaseolus and Dolichos is clearly reflected in the mutual relation of their ferments and globulins. Proteins and enzymes may be thought of as undergoing an evolutionary process comparable to that going on in plant and animal physiological characters in connection with deep-seated changes in the cells, since the recent development of comparative physiology gives new evidence of intimate connec-

tion between structure and physiological processes in organisms. "Thus the question of the origin of systematic units seems to be reduced to a purely chemical problem of the evolution of proteins and other chemical bodies in the protoplasm."

Casuarina root nodules and nitrogen fixation (preliminary contribution), K. ADINARAYANA RAO (*Madras Agr. Dept. Yearbook 1923, pp. 60–67*).—As a result of the present studies, regarded as preliminary in character, Casuarina root nodules are claimed to be extremely beneficial, playing a definite part in the growth of the tree. The fixation of nitrogen is vigorous, comparing favorably with other examples of such function. Mannitol solution and mannite agar are very suitable as liquid and as solid media.

The organism is a strong aerobe, and this fact comports well with the fact that the natural home of Casuarina is in a thoroughly aerated sandy soil.

The bacteria are rod shaped. In advanced stages curved forms are observable. The organism is readily isolated by the usual laboratory methods. Its biological functioning is similar to that of the organism characterizing the legumes.

The structure and behavior of the nucleus in the life history of Phycomyces nitens (Agardh) Kunze and Rhizopus nigricans Ehrbg., E. A. BAIRD (*Wis. Acad. Sci., Arts, and Letters, Trans., 21 (1924), pp. 357–380, figs. 16*).—Noting the existing lack of clear statements regarding the structure and behavior in division of the nucleus in certain fungi, the author contributes details regarding *P. nitens* and *R. nigricans*.

Manual of methods for pure culture study of bacteria (*Geneva, N. Y.: Soc. Amer. Bact., 1923, pp. A48, fig. 1*).—This manual, intended to be used with the descriptive chart of the Society of American Bacteriologists, gives an account briefly of the official reports and outlines historically the several stages and phases that have appeared in the development of this work (E. S. R., 37, p. 819; 41, p. 821; 44, p. 730).

These methods are not to be regarded as official, since constant revision is considered necessary to keep them up to date. For this purpose the loose-leaf form of publication has been adopted, pages of any given edition being identified by the appropriate letter placed before any pagination number. This is edition A on this plan. New methods are to be first printed in the *Journal of Bacteriology* before being embodied in the manual, as a notification to users when they are ready.

GENETICS

Evolution, heredity, and variation, D. W. CUTLER (*London: Christophers, 1925, pp. 147, figs. 27*).—This book deals with an interpretation of evolution from the standpoint of the more recent investigations in heredity and explanations of variations.

Experiments in genetics, C. C. HURST (*Cambridge, Eng.: Univ. Press., 1925, pp. XXIV+578, [pls. 103], figs. [12]*).—A compilation of 38 papers published in various journals from 1897 to 1925 is given, many of which have been previously noted from their original sources.

[Investigations in plant genetics], C. B. DAVENPORT (*Carnegie Inst. Wash. Yearbook 23 (1923–24), pp. 23, 24–31, 39, 40*).—Outstanding among the results of continued research (E. S. R., 54, p. 25) are cited the further confirmation of the interpretation of the secondary trisomic mutants of Datura as due to "fracture" of a chromosome and the accumulation of evidence that in the secondary the extra chromosome may be a doubled half. It was discovered that at the metaphase chromosomes lie so that homologous poles are next to each other or

in intimate contact. Additional evidence of the germinal complexity of certain traits was adduced in the demonstration that at least 10 genetically different factors determine albinism in corn. Important evidence has been gained of the inheritance of the chemical constitution of tissue fluids in plants.

The attack on the gene, J. W. MAVOR (*Sci. Mo., 21 (1925), No. 4, pp. 355–363, figs. 2*).—A popular account of the conception of the gene.

Facts of correlation and hormones in plants [trans. title], F. CAVARA (*Bul. Orto Bot. R. Univ. Napoli, 7 (1924), pp. 265–276*).—A review of data and opinions from various authors is intended to bring the admitted presence and importance of hormones in animal protoplasm into relation with known facts obtained from a study of plants as possibly bearing also upon plant activities.

Chromosomes of Canna and of Hemerocallis, J. BELLING (*Jour. Heredity, 16 (1925), No. 12, pp. 465, 466, figs. 5*).—With the aid of illustrations, the author outlines the chromosome distribution in the reduction divisions for certain polyploidous varieties of Canna and Hemerocallis.

The significance of chromosome studies in fruit breeding, J. S. SHOEMAKER (*Sci. Agr., 6 (1925), No. 2, pp. 47–49*).—Briefly discussing the present status of knowledge concerning the number and function of chromosomes in fruit plants, the author reports that, in studies at the Minnesota Experiment Station with Delicious and Stayman Winesap apples, he found chromosome behavior to be regular in the former and decidedly irregular in the latter variety. In Delicious the haploid number of chromosomes in the pollen mother cells was 14, while in Stayman Winesap the number varied with the individual pollen grains. Both bivalent and univalent chromosomes occurred in Stayman Winesap, indicating the probability that two quite different sets of chromosomes entered into the hereditary constitution of this variety. Abnormalities found in Stayman Winesap pollen, namely, sterility, irregular chromosome distribution, polyspory and polycary, are considered to be possible polyploid characteristics, but, since such may also arise from hybridity, no definite conclusions are reached.

Production of triploid and tetraploid plants, J. BELLING (*Jour. Heredity, 16 (1925), No. 12, pp. 463, 464, fig. 1*).—In this brief article, the author suggests that new varieties of fruit and flower plants may in the future be developed by inducing chromosome aberration in the young flower buds by applying low temperatures. The partial or complete sterility usually associated with triploidy would be of no particular disadvantage in the case of asexually propagated plants, and in some instances would be very desirable.

Inheritance of winter and spring habits in barley, F. D. RUPPERT (*Abs. in Jour. Amer. Soc. Agron., 17 (1925), No. 10, p. 656*).—In studies at the Kansas Agricultural College the F_1 generation of a cross between a winter and a spring wheat showed a partial dominance of the spring habit, but the F_2 generation was intermediate, indicating a complexity of factors.

Heritable characters of maize.—XXII, Purple plumules, M. T. JENKINS (*Jour. Heredity, 16 (1925), No. 8, pp. 307–310, figs. 2*).—According to the twenty-second number of this series (E. S. R., 53, p. 29), some of the seeds on several selfed ears of Iodent corn at the Iowa Experiment Station had purple plumules, the purple color being confined to the plumule sheath or coleoptile in the embryo. Purple plumule is a plant character developing in the embryonic plant and, therefore, is apparent in the seed. It has been subsequently observed in other varieties.

The character purple plumule appears to be due to the action of the dominant allelomorph of a single pair of genetic factors, designated *Pu pu*. The relation of purple plumules to the other factors for plant color is discussed briefly.

Heritable characters of maize.—XXIII, Silkless, D. F. JONES (*Jour. Heredity, 16 (1925), No. 9, pp. 339–341, figs. 2*).—Ears lacking silks were found in two progenies in the second selfed generation of Gold Nugget flint corn at the Connecticut State Experiment Station. While silkless plants produce full-sized tassels shedding pollen, fully fertile, as freely as normal plants, pollinating even the bare cob failed to produce seed, and examination showed the ovules to be rudimentary, without vestiges of stigmatic tissue. More glumes are present than normally, and these are somewhat more developed.

Preliminary study shows this character *sk*, to be in group IV, (*Lg–B–Te*) as designated by Lindstrom (E. S. R., 50, p. 430), linkage with the *B* factor for plant color being clearly indicated with crossing-over of about 10.5 per cent. Crosses with at least one representative of four other groups (I, II, III, and V) have shown independent inheritance.

Heritable characters of maize.—XXIV, Twisted seedlings, P. KVAKAN (*Jour. Heredity, 16 (1925), No. 11, pp. 427–430, figs. 3*).—Studies at Cornell University indicated that three of the twisted types of corn seedlings (Tw_1 tw_1, Tw_2 tw_2, and Tw_3 tw_3), while similar in appearance, are genetically distinct, and are inherited as simple Mendelian recessives. Their linkage relations are discussed briefly.

The crossing of naked oats with different glumed forms [trans. title], S. I. ZHEGALOV (*Nauch. Agron. Zhur. (Jour. Landw. Wiss.), 1 (1924), No. 2, pp. 130–141, figs. 3*).—Hybridization of *Avena nuda inermis* with *A. sativa trisperma*, *A. sativa montana*, and *A. sterilis ludoviciana* was easily accomplished, a normal fruitful progeny being obtained in all cases. The cross with *A byzantina* was made without difficulty, but in F_2 and subsequent generations sterile kernels were profuse.

The F_1 suggested heterozygosis in all cases. On the same panicle were spikelets similar to those of *A. nuda*, to glumed Avena forms, or in different combinations of the characters of both. In the cross with *A. byzantina*, the F_1 approached closer to glumed types. The arrangement of the different spikelets on a panicle was related to the type of branching. On the lowest whorl of branches the naked oats type prevailed, and on the higher whorls the glumed types predominated.

The dark coloration and hairiness of flowering glume, peculiar to some glumed forms, showed in F_1 only on dense glumes or on dense sections of glumes. One pure line of *A. nuda inermis* has a factor for gray coloration of glumes, which factor appears only on densely textured glumed kinds. It is the same factor as for the gray coloration possessed by *A. sativa montana*.

Segregation of glume characters in the cross with *A. sativa* were according to monohybrid ratios, while in crosses with *A. sterilis ludoviciana* and *A. byzantina* a complex segregation was observed. The character of basal callus (suckermouth) (*A. sterilis ludoviciana*) is a monohybrid recessive. It seems that the basal callus can not appear coincidently with membranous covering glume.

The colorations of the glumes were completely independent of their density. In naked forms gray or brown color is observed only on the palea. Characteristics of *A. nuda*, fine glumes, multiflorous spikelets, and long floret rachilla segments are said to be inseparably linked with each other.

In heterozygous plants of F_1 (*A. nuda* × *A. sterilis ludoviciana*), only the covering glumes in the lower floret are covered with hair. When the plant has fine membranous covering glumes, which are more or less smooth, hairs are also seen on the second and third florets. This was also observed on the material in F_2. In the heterozygous F_2 (*A. nuda* × *A. sterilis ludoviciana*)

the position of the basal callus varied significantly. In the pure glumed spikelets they were only observed on the outer grain. When, however, the grain in either way exhibited heterozygous characters, the basal callus appeared on the second, third, or fourth grain of the spikelet. The basal hairs behaved similarly; they are strongly linked with basal callus.

The peculiarity observed in *A. fatua* is closely linked with heterozygosity, and in no case appeared in completely glumed segregates. In crosses with *A. byzantina*, tufts of hair develop on the bases of the second and third grains when membranous glumes are on the lower grain, this hindering the development of their basal hairs.

The correlation of characters in hybrids of Triticum durum and triticum vulgare, W. P. THOMPSON (*Genetics, 10 (1925), No. 3, pp. 285–304*).—Character pairs differentiating *T. durum* from *T. vulgare* were studied in F_2 and F_3 plants at the University of Saskatchewan. Marquis was the *vulgare* parent, and the durum was a highly rust-resistant line selected from Iumillo. The characters observed embraced compactness, head form, diameter of stem, awn length, keel, middle tooth, lateral tooth, glume shape, keel hairs, collar, cavity of stem, seed hairs, and seed form.

The F_2 segregates included those having only or chiefly durum characters, only or chiefly *vulgare* characters, and those with some intermediate characters and about equal numbers of durum and *vulgare* characters. Durum-like segregates commonly showed one or more *vulgare* features, and *vulgare*-like segregates usually showed one or more durum features. Intermediate plants exhibited a high degree of sterility and produced a high proportion of durum and *vulgare* types in F_3. Intermediate types thus tend to disappear in the third and later generations.

Chromosome numbers and their relation to the 13 characters were recorded for F_2 plants. A much higher proportion of plants showed chromosome numbers intermediate between those of the parents (14 and 21) than is reported for F_3 plants. The 14-chromosome plants were of the durum type and the 21-chromosome plants of the *vulgare* type, but most plants of each type showed a few characters of the other type.

Concerning the inheritance of rust resistance in this cross, available records for more than 3,000 F_2 plants and F_3 families (about 30,000 plants in all) show the F_2 ratio of susceptible to resistant to be about 13:1. Of the resistant plants, few were of the general *vulgare* type, although numerous resistant plants had some *vulgare* characters. The few resistant *vulgare*-like plants were not so resistant as the durum parent. While the correlation of rust resistance and durum characters was broken, its dependence on more than one factor may make it very difficult to get the full durum resistance in *vulgare* types without other durum characters.

Evidence presented is considered to indicate that the correlation of characters and partial sterility depends, in part at least, on chromosome incompatibilities, and not entirely on the elimination, due to unbalance, of gametes with intermediate chromosome numbers.

On the extent and causes of natural cross fertilization in rice [trans. title], M. AKEMINE and S. NAKAMURA (*Jour. Soc. Agr. and Forestry, Sapporo, 16 (1924), No. 69, pp. 109–144; also in Ztschr. Pflanzenzücht., 11 (1925), No. 1, pp. 1–22, fig. 1*).—Observations at Hokkaido University on over 100,000 individuals among 19 varieties of rice during 5 years revealed 0.899 per cent of natural cross pollination. The maximum, 2.319 per cent, was noted in Sasaki rice and the least, 0.209 per cent, in Kuromochi. These data were obtained with varieties planted close together. Varieties differed in the amount of

natural crosses, the highest being found in Sempoku, Sasaki, and Shimadamochi, and the lowest in Nioiwase, Kuromochi, and Bozu.

Natural cross pollination is greatly influenced by the weather. It occurs when the flowers open with closed anthers, but not when they open after shedding of pollen. Blooming with unopened anthers may occur when the development of the anthers is incomplete due to varietal peculiarity, when the anthers do not open because of environmental conditions even if fully developed; or when anthers open after opening of the glumes. Low temperature and high humidity increase the amount of closed anther blooming. The percentage of natural cross pollination varies significantly with the temperature and humidity conditions under which the plants grow. When the cause of natural cross pollination is species or varietal peculiarity, high temperatures and dryness increase the amount of hybridization.

Zea mays gigas, W. H. EYSTER (*Jour. Heredity, 16 (1925), No. 5, pp. 185–190, figs. 4*).—A single *gigas* type of plant appeared at the Missouri Experiment Station (E. S. R., 53, p. 426) in the third inbred generation of a strain of Mastodon corn homozygous for the argentia chlorophyll pattern, apparently arising as a genetic variation in the strain and not as a volunteer from another source. A cytological study of the root tips showed that the *gigas* plants have 20 diploid chromosomes which together with the absence of sterility in hybrids between *gigas* and normal plants would seem to indicate that the *gigas* character is not due to chromosome duplication.

The strain has withstood inbreeding without reduction in vigor except in ear size, the inbred plants bearing two well-developed ears and producing an abundance of normal pollen. Both inbred and hybrid strains have surpassed Commercial White corn in grain production. The *gigas* strains are apparently resistant to drought.

Short tail and tailless variations in dogs [trans. title], I. KLODNITZKY and G. SPETT (*Ztschr. Induktive Abstam. u. Vererbungslehre, 38 (1925), No. 1, pp. 72–74*).—The authors cite observations on 9 litters of pups in which short tailed or tailless individuals have been born, the totals being 12 normal, 24 short tailed, and 7 tailless. In most cases the parents consisted of 1 normal mated with 1 tailless or short tailed individual. It is concluded from the results that the short-tail character is controlled by a single dominant factor, while tailless is due to two or more nonsex-linked multiple factors. A decreased vigor has accompanied the abnormality.

Researches on the relation between the season and the sex of the offspring of dogs [trans. title], G. SZUMAN (*Rev. Zootech. [Paris], 4 (1925), No. 7, pp. 49–54, fig. 1*).—The 88,000 dogs listed in volumes 19 and 20 of the German sheep dog stud book are tabulated according to the month of birth and sex ratio, from January 1, 1920, to October 30, 1922. The tabulations, which were made separately for each year, indicate that the largest proportion of males occurred in both years in February, 117.4 and 116.1 per 100 females. The smallest number of males per 100 females in 1920–21 occurred in August, 96.0, and in 1921–22 in September, 96.4, and in January, 94.7. The author concludes that the alterations in the sex ratios which have been found to be uniform from month to month were due to climate, atmospheric conditions, or other factors relating to the change in the seasons.

Sex in the Salicaceae and its modification by eriophyid mites and other influences, J. W. H. HARRISON (*Brit. Jour. Expt. Biol., 1 (1924), No. 4, pp. 445–472, figs. 4*).—Species of Populus and Salix are ordinarily dioecious. Examination of the British Salix species and hybrids disclosed a preponderance of female plants, slight in the diploid forms, but great in the polyploids.

In the diploids this excess, if significant, probably arises from the slower growth of pollen tubes carrying the male-determining gametes. In the polyploids that influence is assisted by the occurence of apomixis with thelytoky, by pseudo-fertilization with thelytoky, and by circumstances arising from peculiarities marking the chromosome complexes of polyploid dioecious plants. Hybrid species of Salix, when arising by combinations of diploid species, invariably include males only. Other hybrids of which at least one parent is polyploid include females only, or at most few males. Certain hybrids produce, in addition to plants of the normal male and female types, androgynous or monoecious forms. These forms are explained as arising through environmental influences temporarily switching the metabolism of a male plant over from its normal condition to that characteristic of the female plant. If that be true, the switch over, and reversal thereof, must occur annually. In the Capreae group intersexual florets occur. These are said to be induced by attacks of eriophyid mites, in particular *Epitrimerus salicobius*. These produce their effects by causing local changes in the metabolism of the plant. The phenomenon is thus one of castration by parasites. In many similar cases now known, fungi are the causal agents.

Sex-determination in Trialeurodes vaporariorum, M. THOMSEN (*Nature* [*London*], *116* (*1925*), *No. 2916, p. 428*).—The author's investigations, conducted at Copenhagen, indicate that the greenhouse whitefly has two races, an American, showing arrhenotokous parthenogenesis, and an English, with thelytokous parthenogenesis.

The oestrous cycle in the mare and some associated phenomena, E. SEABORN (*Anat. Rec., 30* (*1925*), *No. 4, pp. 277–287*).—A study of the oestrous cycle and the accompanying changes in the genital organs of six mares killed at various stages in the cycle indicated that the oestrous cycle in the mare was similar to that in other mammals. The cycle lasts 24 days, which are divided into 4 periods, consisting of a rest period of 8 days, prooestrum of 3 days, oestrum of 3 days, and metoestrum of 10 days. Ovulation occurred toward the middle or end of the oestrous period.

FIELD CROPS

Symposium—plant physiology and agronomic science (*Jour. Amer. Soc. Agron., 17* (*1925*), *No. 11, pp. 661–716, figs. 6*).—The papers included in this symposium have been listed earlier (E. S. R., 51, p. 799).

A recent electrocultural experiment [trans. title], M. KOERNICKE and C. LIPPERHEIDE (*Deut. Landw. Presse, 52* (*1925*), *No. 36, pp. 429, 430, figs. 3*).—In experiments with wheat, barley, horse beans, beans, cabbage, kohl-rabi, and lettuce at Poppelsdorf near Bonn, Germany, the authors found that contrary to the claims of the inventor, the "electrokultivator," designed by C. Fritzsche to utilize atmospheric electricity, failed to affect plants noticeably. Great increases in yield did not follow, damage by pests was not prevented, and a measurable current could not be detected.

The "electrokultivator" [trans. title] (*Deut. Landw. Presse, 52* (*1925*), *No. 37, p. 442*).—Results similar to those noted above were obtained with truck and fruit crops in experiments at Berlin reported on by Schindler.

[Field crops work in Delaware], G. L. SCHUSTER and C. R. RUNK (*Delaware Sta. Bul. 141* (*1925*), *pp. 4–8*).—Microscopic examination of sterile spikelets at the base of the wheat spike suggested that sterility is due to the dwarfed condition of the reproductive organs. The order of dwarfing and

disappearance seems to be first the stamens, then one ovary, and then both ovaries.

White sweet clover persisted over Hubam clover for pasture, and cattle grazed on it when compelled to. Red clover seed from several foreign sources did not seem as good as American seed for Delaware, being more susceptible to winterkilling and anthracnose. American seed, however, was more susceptible to powdery mildew. Broadcasting and harrowing in seemed the best method of seeding crimson clover. Foreign seed did not behave as well as domestic strains.

[Field crops studies in Michigan], J. F. Cox, F. A. Spragg, J. R. Duncan, H. R. Pettigrove, and A. J. Patten (*Michigan Sta. Rpt. 1924, pp. 207, 220–226*).—Experimental work (E. S. R., 52, p. 334) at the station briefly reported on was concerned with milling and baking tests with Michigan wheats, breeding work with corn and potatoes, spacing tests and seed studies with corn, and comparisons of native with imported seed of red clover and alfalfa. Among the investigations at the Upper Peninsula Substation were comparisons of flax-grain and of peas-oats combinations, variety tests with oats, barley, field peas, and clovers, and seeding tests with peas, oats, millets, and potatoes.

[Field crops work in Porto Rico in 1924], D. W. May, T. B. McClelland, J. A. Saldaña, and R. L. Davis (*Porto Rico Sta. Rpt. 1924, pp. 2–4, 11, 12, 14, 15, 18, 19, 21–24, figs. 4*).—The progress of investigations (E. S. R., 51, p. 833) is reported.

Sugar cane.—Next to the practice of rotation, a change of sugar cane varieties appeared to be advisable. Growing immune varieties proved to be the best means of combating the mosaic disease which had threatened the sugar industry. Some of the station hybrids were immune and easier to mill and higher in quality than the Indian canes. St. Croix 12/4, originated at the Virgin Islands Experiment Station, made the highest acre yields on the island at the rate of 8.5 tons of sugar in one case, and in another 81 tons of cane. Varietal susceptibility to diseases and the relative sterility of different sorts are pointed out.

Sugar cane cuttings planted dry germinated 81.4 per cent, soaked in water for 24 hours before planting 86.4 per cent, and in saturated limewater 93 per cent. After 3 months these lots and cuttings treated with limewater and magnesium sulfate had made respective growths of 164, 180, 202, and 220 in.; and the final acre yields amounted to 58.7, 71.9, 72.5, and 85.4 tons of cane. The increased growth of soaked cane was due to the destruction of the borer and to the influence of moisture on germination. Where chemicals were used with water a neutralization of the cane juices tended to prevent rapid fermentation and to conserve stored nutrients.

Tuber and root crops.—Key West and Madeira led the sweet potato varieties in yields and high culinary qualities. Purple Ceylon and Potato yielded best among the yam varieties. With yautias, no definite consistent correlation was apparent between the form of seed piece planted and the weight of the crop harvested. Large tubers of taro and dasheen gave a total yield increase of 17 per cent over small tubers and amply repaid the greater initial cost.

Corn.—Planted in germination flats with controlled water supply, seedlings of different parent ears of corn exhibited marked differences in ability to resist wilting; nor were the differences governed by weight of foliage, several of the strains having the most foliage resisting wilting several days longer than all others. Under field conditions paralleling those of the simulated drought in the laboratory, Espiral and Gigante, the most susceptible strains in the laboratory, were practically eliminated, whereas Cacique-4 and Medio

Cacique–6, resistant strains, were scarcely injured. The parent ear Cacique–1 was the most resistant of all strains to drought under laboratory and field conditions and led in yields. The grain yields confirmed the fact that ears producing seedlings which wilt readily when deprived of water under laboratory conditions are undesirable for planting. Breeding work with sweet corn is noted briefly.

[Field crops experiments in South Carolina] (*South Carolina Sta. Rpt. 1925, pp. 59–61, 81, 84, 89, 90, 91, fig. 1*).—Experiments reported on from the station and substations continuing previous work (E. S. R., 52, p. 528) embraced variety tests with corn, sweet potatoes, soy beans, and peanuts; fertilizer tests with potatoes, sweet potatoes, and tobacco; source of seed trials and comparison of certified with noncertified seed potatoes; and pasture development studies.

The forage crop experiment station at Lodi, Italy [trans. title], M. Bresaola (*Vie Agr. et Rurale, 27 (1925), No. 41, pp. 225–230, figs. 7*).—The activities of the station described comprise improvement and comparisons of the principal legumes and grasses, studies on hard seeds in legumes, source of seed tests, fertilizer trials, weed control, and meadow management.

Selected list of references on grain sorghums, grass sorghums, and broomcorn, compiled by C. L. Phillips (*U. S. Dept. Agr., Bur. Agr. Econ., Agr. Econ. Bibliog. 9 (1925), pp. [4]+9*).—This bibliography lists 64 publications of this Department and 66 miscellaneous publications dealing with grain sorghums, grass sorghums, and broomcorn. The main groups and relationships of many of the varieties are indicated, and the classes and subclasses of grain sorghums specified in the official grain standards of the United States are listed.

Germination test of the grass seeds, L. B. Kulkarni (*Poona Agr. Col. Mag., 17 (1925), No. 2, pp. 75–81*).—Germination tests with seed of *Andropogon annulatus*, *A. contortus* (E. S. R., 51, p. 34), *A. purpureo-sericeus*, *Ischaemum sulcatum*, and *I. laxum*, made under different conditions in the Seed Testing Laboratory, U. S. D. A., are described, with appended comment by E. H. Toole.

The tillering of grain as related to yield and rainfall, R. W. Smith (*Jour. Amer. Soc. Agron., 17 (1925), No. 11, pp. 717–725, fig. 1*).—Data obtained from 8,000 observations on 14 varieties of spring wheat, 20 of oats, and 30 of barley at the Dickinson, N. Dak., Substation during the period 1909–1919 showed that in a comparison of varieties of a crop there was no uniformly close relation between extent of tillering and yield. Comparing groups of crop varieties, durum wheats yielded more but tillered less than varieties of the Bluestem group of common wheat. Four groups of oats were about equal in extent of tillering, but the two midseason groups outyielded the early and late groups. The 2-rowed hulled barleys yielded more and tillered more than the 6-rowed hulled group, and the latter exceeded the 6-rowed naked group in both respects. Oats yielded most and tillered least of the three crops, and barley slightly exceeded wheat in both tillering and yield.

In comparing different years, mean tillering, mean yield, and rainfall from May 16 to July 15, are all closely correlated, indicating the close relationships that exist between rainfall and tillering and between tillering and yield. During dry seasons tillering ability was relatively unimportant, the number of heads per plant approximating one in all varieties. In seasons with abundant rainfall tillering ability enabled the plants to respond to the moisture conditions, resulting in the production of larger yields.

Hygroscopic moisture of cereal grains and flaxseed exposed to atmospheres of different relative humidity, D. A. Coleman and H. C. Fellows

(*Cereal Chem.*, *2* (*1925*), *No. 5*, *pp. 275–287*, *fig. 1*).—Investigations in the Grain Division, U. S. D. A., were concerned with the percentages of moisture in the commercial classes of corn, oats, barley, buckwheat, flaxseed, rice, rye, and wheat, when exposed to atmospheres of approximately 15, 30, 45, 60, 75, 90, and 100 per cent relative humidity at 25 to 28° C.

Wheat appears to respond readily to changes in the humidity of the surrounding air, the rate depending entirely upon the conditions of exposure. Neither protein content nor the percentage of dark hard and vitreous kernels was correlated with the hygroscopic moisture. The hygroscopic moisture of samples of different market classes of wheat did not differ appreciably. The hygroscopic moisture in corn, oats, barley, buckwheat, rice, and rye did not differ greatly from that of wheat. Flaxseed contained appreciably lower percentages of hygroscopic moisture than the cereals studied.

Hygroscopic moisture does not increase at a uniform rate when in equilibrium with increasing relative humidity of the atmosphere. Each increment of increase in humidity is accompanied by an acceleration in the rate of increase in content of hygroscopic moisture. The curve resulting from plotting humidity as abscissas against hygroscopic moisture as ordinates takes the form of a parabola.

Post-harvest growth in immature barley kernels, M. N. Pope (*Abs. in Jour. Amer. Soc. Agron.*, *17* (*1925*), *No. 10*, *p. 658*).—When immature barley was cut and left on the straw the kernels increased in size of both endosperm and embryo. Where the kernels were shelled or peeled, little or no development took place.

Crossed corn, D. F. Jones and P. C. Mangelsdorf (*Connecticut State Sta. Bul. 273* (*1926*), *pp. 153–187*, *figs. 27*).—Methods of utilizing the phenomenon of hybrid vigor or heterosis in increasing yields and stimulating the growth of the corn plant are described from the results of intensive studies at the station. The merits of different methods of seed selection are indicated, with a discussion of the technique of selection in self-fertilized lines, producing crossed seed, and the production of double, multiple, and modified single crosses.

[**Cotton investigations in South Carolina**] (*South Carolina Sta. Rpt. 1925*, *pp. 20–35*, *82*, *83*, *figs. 2*).—The further progress of experiments with cotton (E. S. R., 52, p. 531) is summarized.

Fruiting studies.—At Clemson College blooms produced early in the flowering period seemed to have a much greater chance of producing open bolls than those appearing later. Observations on about 20 varieties disclosed that the variety with a large or medium-sized boll that fruits most rapidly during the first two or three weeks of the fruiting season is the one which yields most under boll weevil conditions. So far indications are that fertilizer, spacing, and cultural practices do not affect the period required for an individual square or boll to develop. The main differences observed were due to varietal variations and seasonal effects.

Study of the influence of light and moisture on the square and boll period indicated that cotton plants in dry soil fruit more rapidly early in the season than those in wet soil. It takes longer for a square to develop to a bloom and longer for a boll to mature in moist soil than in dry soil. Defoliation does not hasten the maturity or opening of the bolls; under certain conditions a reverse effect is noticeable.

Spacing.—Cotton properly poisoned at Florence yielded highest at 6- to 9-in. spacings. Closely spaced cotton put on squares much faster than wider spaced stalks. At the Coast Substation 3.5-ft. rows with plants 10 in. apart

in the drill gave the highest yield. Spacing had practically no effect on the developmental period of the fruit, about 25 days being required for the production of the squares to the blooming stage and about 44.5 days from bloom to open boll for all spacings. Plats blocked with a hoe yielded 1,477 lbs. per acre, as compared with 1,397 lbs. for regular chopping. With 1, 2, 3, and 4 stalks in hills 12, 18, and 24 in. apart, the highest yield in each group was obtained with a combination averaging 1 stalk every 6 in. in the drill. During 3 years these tests indicated that the best spacing provides between 15,000 and 20,000 plants per acre, the combination being unimportant.

Seed and planting.—Seed delinted with sulfuric acid continued to outyield seed machine delinted, untreated, or rolled in sodium nitrate, gave perfect stands in much less time, and the plants began blooming first and continued fruiting most rapidly early in the season. Plantings during the latter half of March excelled in yield at Florence, while tests at Clemson College suggest planting between April 10 and April 25 for best results in the average season. Without exception, the first blooms and the heaviest fruiting occurred in the first plantings, which also matured a larger percentage of the total crop.

Boll weevil control.—In all cases a decreased acre yield of seed cotton followed topping as compared with untopped plants, the losses increasing with the percentage of buds removed. If weevils are abundant enough to kill from 10 to 20 per cent of the young buds, it would apparently be profitable to poison early. Up to a certain date, about July 16 in 1925, bolls produced under low fertility conditions were harder (determined by resistance to needle puncture) than those on plants in more fertile soil.

Varieties.—Cleveland and Cook led the varieties under drought conditions at Clemson; dusted throughout the season, certain Cleveland strains and Dixie Triumph led the short staples at Florence, and Delfos 6102, Salsbury, and Carolina Foster the long staples; and at the Coast Substation Woolsey Cleveland and Dixie Triumph led the short staples and Lightning Express the long staples. The 3-year averages at Florence show Cleveland strains first among the short staples and Carolina Foster, Delfos, Lightning Express, and Webber 49 leading the long-staple varieties.

Fertilizers and rotations.—The slight difference in the cotton yields produced by sodium nitrate and ammonium sulfate, indicated that they are similar in efficiency when applied in equivalent amounts. Side applications of sodium nitrate seem best soon after chopping. For cotton production a rotation of cotton, corn, oats, and peas at Florence seemed to maintain the fertility as well as 1,000 lbs. of 8–4–4 fertilizer applied to land continuously in cotton. However, a combination of systematic rotation and adequate fertilization appears to be needed to produce cotton economically. Cooperative fertilizer tests on representative soil types in the State indicated that applications of phosphorus and potash to corn and oats may be considerably reduced, if not entirely eliminated, when the crops are planted in a regular rotation after cotton liberally fertilized with complete fertilizer.

Reports [on cotton investigations] received from the experiment stations for the seasons 1923, 1924, and 1925 (South Africa only) (*London: Empire Cotton Growing Corp., 1925, pp. 48, pls. 15*).—Experiments with cotton conducted under the auspices of the Empire Cotton Growing Corporation are reported on for Tanganyika by B. C. Wood and for Nyasaland by H. C. Sampson. F. R. Parnell discusses the breeding of jassid-resistant cotton (E. S. R., 54, p. 234) at Barberton, South Africa, and L. H. Burd describes the characteristics and spinning qualities of nine pure strains of Sea Island cotton tested in St. Vincent.

Characteristics of Indian cottons (In *Bombay Cotton Annual, 1923-24, compiled by* F. F. WADESON. *Bombay: East Indian Cotton Assoc.* [*1925*], *pp. 36-41*).—Descriptions are given for the Indian cottons known as Bengal, Deshi, Oomra, Broach, Dhollera, Kumpta, Western and Northern, Dharwar-American, Punjab-American, Tinnevelly, Karunganni, Cambodia, Burma, and Shan State, and their spinning qualities are indicated.

Influence of time of harvest on the quality of flaxseed [trans. title], G. BREDEMANN (*Faserforschung, 4* (*1925*), *No. 4, pp. 234-243*).—Flax plants were pulled at stages of maturity ranging from stalks two-thirds green with green capsules and seed to a dead-ripe stage with brown stalks, seed, and capsules. Seed from yellow-ripe plants weighed much more per 1,000 than those harvested in the green-ripe stage, and only slightly less than seed from fully ripe flax. Differences in the average germination of the several classes of seed were slight. Apparently seed will ripen well if allowed to remain on the stalks, even if the plants be pulled when quite green.

Pollination studies with orchard grass, T. K. WOLFE and M. S. KIPPS (*Jour. Amer. Soc. Agron., 17* (*1925*), *No. 11, pp. 748-752, figs. 2*).—In pollination studies with orchard grass at the Virginia Experiment Station some clonal lines set a higher percentage of seed than others. While some lines are more self-fertile than others, the production of self-pollinated seed should be, as a whole, accomplished fairly easily. Paper bags were found more satisfactory for self-pollinating orchard grass flowers than cotton cages. From 1.2 to 17.5 per cent of flowers set plump seed when they were self-pollinated, 0.5 to 27.1 when close pollinated, and 7.3 to 50 per cent when open pollinated. Results of germination tests indicate that self-, close-, and open-pollinated seeds of orchard grass germinate equally well.

Variations in varieties of canning peas, II, F. H. HALL (*New York State Sta. Bul. 532* (*1925*), *pp. 3-9*).—Further comparison studies made of 51 varieties of peas known to be or possibly suitable for commercial canning confirmed the earlier conclusion (E. S. R., 52, p. 832) that "strains" of canning peas of the same variety, as grown by or for different seedsmen, differ markedly in practically all characteristics determining canning value. Apparently only a few years of culture, selection, and roguing of a variety according to one seedsman's ideal of type will develop a pea practically distinct as to canning characteristics from that grown in the same or a different locality by another seedsman having another type ideal.

Extra Early, Hustlers, Rice No. 330, Velocity, Rogers "12," Acme, Chelsea Rival, and Maincrop seemed worthy of further study. In favorable seasons Duke Delight, Home Delight, Richard Seddon, Little Marvel, Lincoln, and Witham Wonder might also be considered.

The cultivation, preparation, and utilisation of the ground-nut (*Bul. Imp. Inst.* [*London*], *23* (*1925*), *No. 3, pp. 291-330, pls. 3*).—The culture and use of the peanut are described briefly, with a summary of the status of peanut culture in countries of the British Empire.

The effect of invironmental conditions on the potato tuber [trans. title], H. NEUMANN (*Jour. Landw., 73* (*1925*), *No. 1, pp. 7-38*).—The influence of different soil types with varied soil moisture contents, different fertilizers, several forms of nitrogen and manure, and of cultivation on the characteristics of the potato tuber were studied at Göttingen, Germany.

Within a test row, the tuber seemed to lengthen with increase in weight. The form of tuber can be modified by nutrition, and indeed, the development of form showed itself independent of development of size. Nitrogen is considered as a form-altering factor, causing elongation of the tuber, while po-

tassium-phosphorus fertilization and high moisture favor thickening. The influence of the soil on tuber form probably depends on its air content, a soil with better aeration producing a shorter type. Sandy soil gave the shortest types, and the heavier soils produced elongated tubers. Cultivation during the vegetative period produced a shorter form, and manured plats produced a shorter form than unmanured plats.

The relation between long cylindrical form and low starch content and between short flat form and high starch content was regularly confirmed. The size of the lenticels was increased through enhanced water supply. The depth to which lenticels developed was apparently not related to the factors studied.

Hill-unit selection of potatoes, J. R. LIVERMORE (*N. Y. Agr. Col. (Cornell) Ext. Bul. 125 (1925), pp. 11, figs. 3*).—This bulletin outlines in detail the method of hill-unit selection of potatoes practiced and recommended by the department of plant breeding, Cornell University.

Some statistical observations on a yield test of potato varieties, L. E. KIRK and C. H. GOULDEN (*Sci. Agr., 6 (1925), No. 3, pp. 89–97*).—Twenty distinct varieties of potatoes, 17 of which were the product of superior single tuber selections, were each tested in 15 systematically distributed rod rows at the University of Saskatchewan in 1924. Every fifth row was a check. Inspection of the tabulated yields of individual plats showed the soil to be highly variable, requiring extensive replication in order to obtain reliable results. Determinations by the check plat method and by the deviation of the mean method showed the probable error of the experiment to be very high and for practical purposes the same in both cases. The deviation of the mean method appeared to give a reliable probable error and seemed of special value when the number of checks is small.

The value of replication was studied by determining probable errors by the deviation of the mean method for 1 plat and the means of 2, 3, 5, and 7 systematically distributed plats. The reduction in variability was very close to mathematical expectation and indicated that at least 7 systematically distributed rod row plats were required for a reliable test. The relation of the correlation between plat yields and the probable error of a difference is discussed briefly. The correlation between nearby plats was found to be significant enough to be considered. For adjacent plats, $r^{xy}=0.6707\pm0.0194$, 3 apart 0.5967 ± 0.0234, 6 apart 0.5042 ± 0.0283, and 10 apart 0.4864 ± 0.0305.

A statistical study of the composition of potato tubers, J. J. WILLAMAN and R. M. WEST (*Minn. Univ., Studies Biol. Sci., No. 5 (1924), pp. 211–227, figs. 5*).—A more extensive discussion is presented of the investigations noted earlier (E. S. R., 50, p. 135) from a summary report.

The North American species of Stipa, A. S. HITCHCOCK (*U. S. Natl. Mus., Contrib. U. S. Natl. Herbarium, 24 (1925), pt. 7, pp. III, VII, 215–262, pls. 3*).—The species of Stipa, one of the larger genera of the grass family, are found throughout the temperate regions of the world and are especially characteristic of steppes, plains, deserts, and other arid and semiarid regions. They form an important part of the forage of the western plains and foothills of the United States. This paper is a revision of the North American species, of which there are 40, five being described as new.

Synopsis of the South American species of Stipa, A. S. HITCHCOCK (*U. S. Natl. Mus., Contrib. U. S. Natl. Herbarium, 24 (1925), pt. 7, pp. III, 263–289*).—A synopsis is given of the South American species of Stipa represented in the United States National Herbarium. Eighty-nine species, 19 of which are described as new, are included.

The sugar beet in California, R. L. ADAMS (*California Sta. Circ. 302 (1926), pp. 34, figs. 11*).—This is a revision of and replaces Circular 165 (E. S. R., 37, p. 443).

Ways of increasing sugar beet yields, A. C. MAXON (*Abs. in Jour. Amer. Soc. Agron., 17 (1925), No. 10, p. 656*).—Among farm practices shown to increase sugar beet yields were leaving the largest beets at thinning time; leaving a beet every 12 to 14 in. apart in 20-in. rows; and early irrigation in years when the precipitation of the preceding winter and spring had been scanty. The highest sugar content of the beet was just below the crown in August, somewhat lower in September, and still lower in October.

The optimum time of applying ammonium sulfate to sugar cane [trans. title], T. A. TENGWALL (*Arch. Suikerindus. Nederland. Indië, Meded. Proefsta. Java-Suikerindus., 1925, No. 6, pp. 251–277*).—On plantations in Java ammonium sulfate is usually applied to sugar cane at the rate of 75 to 150 lbs. per acre before or at planting time. In extensive field trials ammonium sulfate applied after the cane was up gave average yield increases of 2.8 per cent of sugar and 3.1 per cent of cane. On heavy soils differences between early and late application could hardly be noted, whereas on light soils early application was distinctly unfavorable. While earlier and more abundant stooling with more stalks per unit area sometimes followed application before planting, a larger number of stalks accompanied a greater sugar production in only about one-fifth of the tests. The first application can probably be made best at the time of replanting misses and the second, and perhaps the third, at 1-month intervals over a 60-day period. On porous sandy land where the ammonium sulfate may leach, it may be applied more often over a longer period.

Type classification of American-grown tobacco (*U. S. Dept. Agr., Misc. Circ. 55 (1925), pp. II+15*).—A classification prepared by F. B. Wilkinson indicates the leading types of American-grown tobacco embraced under the terms flue-cured, fire-cured, air-cured, cigar-filler, cigar binder, cigar wrapper, and miscellaneous types. An index to types by trade names is included.

Key to the cultivated wheat varieties of France, G. STEWART (*Jour. Amer. Soc. Agron., 17 (1925), No. 11, pp. 741–747*).—An approximate translation is given of the key included in Les Blés Cultivés (E. S. R., 49, p. 134), by Denaiffe, Colle, and Sirodot.

Einkorn wheat [trans. title], K. FLIAKSBERGER (*Trudy Prikl. Bot. i Selek. (Bul. Appl. Bot. and Plant-Breeding), 15 (1925), No. 1, pp. 207–227, figs. 9*).—Varieties of wild monococcum newly established included *Triticum monococcum aegilopoides* var. *pseudo-Baeoticum*, var. *symbolonense*, var. *Baidaricum*, var. *Hellenae*, and *T. monococcum cereale* var. *artiaristatum*. A determinative key to the wild sorts of *T. monococcum aegilopoides* is included, with a map showing the distribution of *T. monococcum* in southern Europe and Asia Minor.

Persian wheat in regard to its milling and baking qualities [trans. title], K. M. CHINGO-CHINGAS (*Trudy Prikl. Bot. i Selek. (Bul. Appl. Bot. and Plant-Breeding), 15 (1925), No. 1, pp. 203–206, fig. 1*).—Persian wheat, *Triticum persicum*, without admixture of flour of other wheats was found to be characterized by a low baking strength. In some respects, e. g., softness of the crust, brown color, and readily breaking into granulated flour when ground, Persian wheat resembles durum wheats.

[Seed and weed control in Wisconsin, 1922–1924], A. L. STONE (*Wis. Dept. Agr. Bul. 69 (1924), pp. 113–135, figs. 14*).—The activities of the seed and weed control division of the Wisconsin State Department of Agriculture are reported for the biennium ended June 30, 1924.

Weeds, F. DUYSEN, rev. by E. EGGLHUBER (*Unkräuter, Berlin: Walter de Gruyter & Co., 1925, pp. [2]+114, figs. 59*).—This practical handbook describes and illustrates weeds important in Germany and briefly indicates their habitats and control methods.

Note concerning Johnson grass as a weed in Ohio, C. J. WILLARD (*Jour. Amer. Soc. Agron., 17 (1925), No. 11, pp. 755, 756*).—The reported instances of high resistance to winterkilling shown by Johnson grass indicate the danger of introducing the weed into the southern portion of the Corn Belt.

The eradication of weeds, H. W. HESSE (*New Zeal. Dairyman, 28 (1924), Nos. 9, pp. 11–19; 10, pp. 11–16; 11, pp. 11–19; 12, pp. 11–16*).—In view of the increasing weed menace in New Zealand, the author indicates the damage caused by weeds, shows their means of dissemination, and outlines general methods of prevention and suppression. Special directions are given for the control of blackberry, California thistle, fern, bracken fern, hard fern, soft fern, manuka, piri-piri, ragwort, goosefoot, spurrey, hoary cress, gorse, tutu, buttercup, couch grasses, dodder, broom rape, dock, sorrel, and miscellaneous weeds.

Spraying weeds with dilute solutions of sulfuric acid [trans. title], A. ÅSLANDER (*Nord. Jordbrugsforsk., 1925, No. 3–4, pp. 126–146, figs. 8*).—The effects of sprays of sulfuric acid solutions of various strengths were studied with field and pot-grown charlock (*Brassica arvensis*) and oats, barley, peas, and red clover. The stimulant and nutrient value of the acid is also discussed briefly.

Studies of leaves from sprayed and unsprayed charlock plants showed that under ordinary conditions sulfuric acid penetrates the tissue very rapidly and kills the cytoplasm without causing plasmolysis, decomposes the chlorophyll as it unites with the magnesium atom in the chlorophyll molecule, and destroys the chloroplasts. While cell walls are generally not affected, they sometimes seem to be destroyed in the spongy parenchyma of very yonng leaves. After sulfuric acid has killed the protoplasm, the changes in the leaves are due to desiccation. The action of the acid within the tissues is neutralized by its absorption, which takes place chiefly in the cell walls, the absorbing matter probably being inorganic salts. Therefore, more sulfuric acid is needed to kill leaves with thick cell walls, as in winter-grown charlock, than the thin leaves seen on pot-grown charlock. If the acid spray is not sufficient to kill the whole leaf only the epidermis and one or two layers of underlying cells may be killed.

Barley, oats, and peas are protected against the acid by layers of wax on the snrfaces of the stems and leaves. Since the wax layer is thinner on the lower than on the upper leaf surfaces, the spray may burn the ends of the leaves where their lower snrfaces are exposed, while not injuring other parts of the plant. Dense hairs on the leaves protect red clover. Some weeds, e. g., *Chenopodium album*, are protected by glandular hairs, but, as these do not occur on the stems, the plants can be killed if the fields are rolled before spraying so that the spray may reach the stems.

HORTICULTURE

[Horticultural investigations at the Delaware Station], L. R. DETJEN (*Delaware Sta. Bul. 141 (1925), pp. 19–24*).—The usual annual report (E. S. R., 52, p. 836.)

In closing up that portion of the fruit drop project relating to pollination, fertilization, and embryo development, the author reports that in normal years, in mixed plantings, the majority of the flowers are properly fertilized, indicating that a lack of pollination is not the chief cause of physiological drop in

fruits. *Microscopic examination of abscised fruits showed a complete egg apparatus*, though often very much undersized or undernourished.

Records taken on the dropping fruits of three plum trees, representing three species, showed such a marked lack of coincidence that the author concludes that genetic differences are the governing factors in abscission. The lack of influence of soil fertility on the abscission of immature fruits was shown in records taken on three Jonathan trees receiving no, moderate, and high fertilization. The number of waves and their duration were in no way connected with soil fertility.

Cabbage breeding studies gave further evidence that distinct and self-reproducing strains may be isolated from a mixed population. Studies of bolting in cabbages indicated that in certain strains this phenomenon is controlled by genetic factors. Of 39 cabbage plants flowered under cages in the greenhouse, none proved fully self-compatible. Self-compatible plants were often highly cross-compatible with sister plants and plants of other strains. On the other hand, self-incompatible plants were also found to be highly incompatible with sister plants and plants of other strains.

[Horticultural investigations at the Porto Rico Station], T. B. McClelland, J. A. Saldaña, and H. C. Henricksen (*Porto Rico Sta. Rpt. 1924, pp. 15–17, 20, 21, 24–26, figs. 3*).—As recorded in the preceding report (E. S. R., 51, p. 837), potash and nitrogen were more effective than acid phosphate in increasing the yield of coffee plants. Used in combination with acid phosphate and potash, sulfate of ammonia was significantly more effective than was nitrate of soda. Seedling hibiscus originated at the station contained many beautiful new varieties. Satisfactory progress in developing tomato seedlings resistant to bacterial blight was recorded. A hybrid of the native melon crossed with Casaba showed considerable uniformity in plant and fruit characters but was lacking in quality. Hybrids between the native melon and Salmon Tint Pollock contained some individuals combining size, shape, and ribbing of the native with the sweetness of the other parent.

Soil conditions unfavorable to pineapple plants, manifested in inferior size and color of the plants and leaves, were partly, but not entirely, corrected by the use of organic materials such as manure, straw, and muck. Subsoiling to a depth of 18 in. was also beneficial. Observations on pineapples growing in sand and water cultures indicated that no fertilizers are needed during the first few weeks. After this period nitrogen and potash are required in large quantities. Phosphorus did not appear important. Pineapple plants removed no ammonia from the nutrient solution, but used other forms of nitrogen, especially potassium nitrate. The addition of sulfur to dried blood apparently rendered this material more available for the pineapple.

[Horticultural investigations at the South Carolina Station] (*South Carolina Sta. Rpt. 1925, pp. 55–59, figs. 3*).—The usual annual report (E. S. R., 52, p. 537) upon horticultural activities.

Cooperative experiments conducted in the Sand Hill and Piedmont sections indicated the value of high-grade fertilizers in increasing the yield of peaches. However, highly fertilized trees were later in ripening their fruits. The Bailey, Extra, and Armalga grapes are recorded as promising varieties.

Spray bulletin, W. E. Britton and G. P. Clinton (*Connecticut State Sta. Bul. 271 (1926), pp. 91–140, figs. 95*).—A revised edition of a previously noted bulletin (E. S. R., 49, p. 534).

Report on commercial insecticides and fungicides, 1925, E. M. Bailey (*Connecticut State Sta. Bul. 272 (1925), pp. 141–150+IV*).—The usual annual

report (E. S. R., 52, p. 537) upon the results of analyses of spraying materials collected during the calendar year.

Results of some experiments in pruning and training greenhouse cucumbers, H. W. SCHNECK (*Amer. Soc. Hort. Sci. Proc., 21 (1924), pp. 121–129*).—Careful records taken at Cornell University upon greenhouse cucumber plants trained to single and multiple stems indicated the commercial superiority of the single stem, notwithstanding the greater yield, larger proportion of marketable fruits, and superior top and root growth of the extension stem plants. The commercial superiority of the single-stem plants lay in the greater number that could be grown upon a given area. The single-stem plants were also markedly superior in the yielding of a larger proportion of early ripe fruits.

The culture of witloof chicory, J. SIMON (*Culture de la Chicorée de Bruxelles ou Witloof. Brussels: Author, 1924, pp. 47, figs. 17*).—Practical information is offered on the culture, forcing, and marketing of witloof chicory.

The quality of packet vegetable seed on sale in New York in 1924, M. T. MUNN (*New York State Sta. Bul. 533 (1925), pp. 3–27*).—A presentation, for the most part in tabular form, of the results of examination and germination tests of 600 packets of vegetable seed collected from 30 seedsmen or dealers during the planting season of 1924. Of these packages, 18 per cent were of such poor quality as to be classified as worthless. As noted in a previous publication (E. S. R., 51, p. 238), the packets of a single variety differed widely in selling price, weight of contents, number of seeds per ounce, and in viability. In general, the offerings of any one seedsman were approximately similar in quality irrespective of variety.

New or noteworthy fruits, VIII, U. P. HEDRICK (*New York State Sta. Bul. 531 (1925), pp. 3–14, pls. 4*).—The eighth in a series of bulletins (E. S. R., 52, p. 46) relating to fruits found worthy at the station, this features the Medina apple, Phelps pear, American Mirabelle plum, and Sheridan grape, all illustrated in color. Other fruits described are the Lodi, Orleans, Milton, Sweet Delicious, and Sweet McIntosh apples, the Pulteney pear, Brant raspberry, Pontiac grape, President and Santa Rosa plums, and Giant cherry. With the exception of the three last-named varieties, all are station originations.

Pot experiments on the manuring of fruit trees, IV, T. WALLACE (*Univ. Bristol, Agr. and Hort. Research Sta. Ann. Rpt. 1924, pp. 12–24*).—This, the fourth report (E. S. R., 52, p. 140) on the manuring of fruit trees, discusses results attained in the 1924 season with apples, gooseberries, black currants, raspberries, and strawberries.

As in preceding years, the value of nitrogen and phosphoric acid for fruit plants was significantly demonstrated. Strawberries, however, being in their fourth season, made poor growth irrespective of manurial treatment, none of the lots being in a condition to survive into 1925. Observations on apple, gooseberry, black currant, and strawberry plants growing in nutrient solutions deficient in phosphoric acid and having pH values of 3 and 6.6 showed only slight differences that could be associated with the variation in acidity, and behaved for the most part like the regular phosphoric acid deficient plants.

Experiments in cool storage of fruit, D. B. ADAM and J. E. HARRISON (*Jour. Dept. Agr. Victoria, 23 (1925), No. 11, pp. 678–681*).—Of two lots of Bartlett (Williams) pears harvested one week apart, the later-picked fruits kept longer and retained their quality better in cold storage. At 32, 34, and 37° F. the pears kept in good condition for from 13 to 14, 9 to 10, and 7 to 8

weeks, respectively. Storage tests at 34° with three varieties of plums, namely, Wickson, Fellenberg, and President, showed the last named to be decidedly the best and the first the poorest keeper. Of 14 vinifera grapes tested at 34°, the Ohanez was by far the best-keeping variety, holding in excellent condition in cork sawdust for over three months. Ohanez grapes harvested when fully grown and sweet, but still green in color and firm, kept best, and of several temperatures utilized 32° was the most satisfactory.

Apple survey of the United States and Canada, R. W. REES (*New York: N. Y. Central Lines, Dept. Agr. Relat., 1926, pp. 64, figs. 17*).—Based on travel throughout the apple-producing regions of the United States and also on extended studies, the author presents a comprehensive discussion of present conditions and future prospects in the various districts, offering in general an optimistic outlook for the apple indutry.

The influence of certain environmental and cultural conditions on fruit-bud formation of pear and apricot, C. B. WIGGANS (*Jour. Agr. Research [U. S.], 31 (1925), No. 9, pp. 865–883, pls. 6, figs. 3*).—In order to determine the influence of environmental factors on the differentiation and development of fruit buds in the Bartlett pear and the Royal apricot, an examination was made of buds collected at frequent intervals from orchards in the Sierra foothills and interior and coastal valleys. Material was also collected from severely and lightly pruned trees and from irrigated and nonirrigated trees.

Pear and apricot buds began to differentiate at approximately the same dates, irrespective of locality. Pruning had no apparent effect on the time of differentiation. Irrigation, however, seemed to have a retarding influence. In respect to development following differentiation, the high altitude of the interior valleys exerted a retarding influence until the middle of September, when development became more rapid. Under humid coastal conditions pears showed a rapid development following differentiation. In the apricot, on the other hand, no stimulation was noted until October, when development became very rapid, forcing the buds to go into the winter at a more advanced stage than those in the interior valley or foothill orchards. In the interior valley, both pear and apricot buds underwent a steady, uniform development. In none of the localities did the winter conditions have any apparent checking influence on fruit-bud development.

Variations in the Japanese pear caused by different combinations of fertilizer elements, A. KIKUCHI (*Amer. Soc. Hort. Sci. Proc., 21 (1924), pp. 342–350*).—The material herein presented has been, for the greater part, previously noted from another source (E. S. R., 53, p. 536).

Smyrna fig culture, C. G. SAVAGE (*So. Aust. Dept. Agr. Bul. 186 (1925), pp. 20, figs. 8*).—General information is offered on fig production and the rôle of the Blastophaga insect in fertilization, together with notes on the introduction of the insect into South Australia.

Cold storage of Florida grapefruit, L. A. HAWKINS and W. R. BARGER (*U. S. Dept. Agr. Bul. 1368 (1926), pp. 7*).—From the results of studies conducted in the cold-storage plant at Arlington Va., with carload shipments of Florida grapefruit, the authors conclude that cold storage of this fruit is commercially practicable, thus confirming results previously secured with small consignments (E. S. R., 46, p. 339). Records showed that for grapefruits destined to be held for more than six weeks in storage, precuring by exposure to from 70 to 75° F. with relative humidity of 65 per cent or by exposure to the gases generated in the incomplete combustion of kerosene stoves reduced skin-pitting injury. The kerosene treatment was superior, being beneficial also in the loosening of the stem buttons, the absence of which tended

to reduce disease infection in the fruits. Grapefruit destined for cold storage in the late season should be picked before becoming overripe.

Study of flowers and pollen grains of Carica papaya, L. B. Kulkarni (*Poona Agr. Col. Mag., 17 (1925), No. 3, pp. 127-129*).—Brief notes are offered on the types of flowers and the manner of fertilization in the papaya.

Rose culture, A. Laurie (*Michigan Sta. Circ. 84 (1925), pp. 3-7, figs. 2*).—Brief popular information is offered on the culture, propagation, pruning, and varieties of roses.

Bulb gardening, A. J. Macself (*London: Thornton Butterworth, 1925, pp. 223, pls. 12, figs. 19*).—General information is presented concerning outdoor and indoor culture of various bulbs, tubers, and corms.

FORESTRY

[Forestry investigations at the Porto Rico Station], D. W. May (*Porto Rico Sta. Rpt. 1924, pp. 6, 7, fig. 1*).—Approximately 60 acres of land were planted during the year with seeds and seedlings of several forest species, including mahogany, eucalyptus, and palo de Maria, the last-named species growing exceptionally well under adverse conditions and showing value as a source of cabinet wood. Nonclimbing legumes were useful in protecting young seedlings and increasing the fertility of the soil.

[Forestry investigations at the South Carolina Station] (*South Carolina Sta. Rpt. 1925, pp. 76-80, figs. 5*).—Investigations conducted at the Coast Substation show that several of the native species of pine make extremely rapid growth. For example, slash pines planted eight years were found to be over 20 ft. in height and 5 in. in diameter. Loblolly and long-leaf pines also made satisfactory growth. The exclusion of fire from burned-over and pasture lands led to the development of thick stands of pines.

A primer of forestry (*Perth: West. Aust. Dept. Ed., 1925, 2. ed., pp. 134, pl. 1, figs. 108*).—A revised and somewhat enlarged edition of a previously noted work (E. S. R., 50, p. 743), prepared under the direction of S. L. Kessell.

Recent progress in Indian forestry, E. P. Stebbing (*Jour. Roy. Soc. Arts, 74 (1925), No. 3812, pp. 68-95*).—A discussion of the present status of forestry in British India.

What the national forests mean to the intermountain region, F. S. Baker (*U. S. Dept. Agr., Misc. Circ. 47 (1925), pp. 21, figs. 10*).—An effective presentation of the important rôle that the forested mountainous areas have played and are now playing in the development of the intermountain region, embracing Nevada, Utah, and parts of Wyoming, Idaho, and Arizona. The author points out that the lumber, irrigation water, hydroelectric power, and grazing furnished by the mountains are the foundations of the prosperity of the valleys, and, in conclusion, pleads for a rational use of the forests and grazing areas so that these resources may be permanently maintained.

The importance of seed source and the possibilities of forest tree breeding, J. Roeser, Jr. (*Jour. Forestry, 24 (1926), No. 1, pp. 38-51*).—This paper, discussing the application of genetics to the breeding of forest trees, presents a review of European work and suggests potential possibilities for investigation.

Methods of stimulating germination of western white-pine seed, J. A. Larsen (*Jour. Agr. Research [U. S.], 31 (1925), No. 9, pp. 889-899, figs. 2*).—Studies at the Priest River Forest Experiment Station, in northern Idaho, upon the causes of slow germination in western white-pine seed led to the conclu-

sion that delayed germination is not due to any inherent physiological characteristic of the seed embryo, but rather to the impermeability of the seed coat. That a rest period is not required by this species was indicated in germination tests of four lots of seed gathered August 6 and 15 and September 1 and 17 from a single tree. Sowings in the greenhouse on November 21 showed the most rapid germination in the earliest gathered lot, with the highest total germination in the last lot. Four methods of procuring prompt germination are suggested: (1) Immersion for 45 minutes in concentrated sulfuric acid, followed by thorough rinsing, (2) mechanical abrasion, (3) soaking for 24 hours in cold water, followed by exposure to air freezing for at least 40 days, and (4) stratification for 3 weeks in a relatively warm temperature in moist bark-free sawdust. Except for the danger of decay, satisfactory germination may also be secured from late fall sowings.

Cultural tests with various forest species [trans. title], F. KRAMER (*Dept. Landb., Nijv. en Handel [Dutch East Indies], Meded Proefsta. Boschw., No. 12 (1925), pp. IV+99, pls. 18*).—As indicated in the title, this pamphlet discusses the cultural requirements of various East Indian species of use in industrial and construction work.

Important forest species of the Dutch East Indies, I [trans. title], L. G. DEN BERGER and F. H. ENDERT (*Dept. Landb., Nijv. en Handel [Dutch East Indies], Meded. Proefsta. Boschw., No. 11 (1925), pp. [3]+136+[18]; [Sup.], pls. 15*).—The authors discuss the distribution, growth habits, and common names of the trees, and present information on the qualities, characteristics, and uses of the wood. Photographic reproductions of tangential sections of the wood of some of the more important species are presented under separate cover.

Eucalyptus trials in the Simla Hills, R. N. PARKER (*[Indian] Forest Bul. 63 (1925), pp. 27*).—Herein are presented the results of species tests of Eucalyptus, indicating those varieties which appear to have special merit.

A note on the working qualities of some common Indian timbers, H. E. KINNS (*[Indian] Forest Bul. 66 (1925), pp. [4]+43*).—The author presents data on the characteristics of 28 species of Indian woods and their adaptability to various uses.

The microscopic identification of woods, J. R. BEVERSLUIS (*De Micrografische Indentificatie van Hout. Proefschr., Landb. Hoogesch., Wageningen, [1925], pp. [4]+132*).—In connection with a survey of the present status of knowledge upon the identification of woods by the use of anatomical characters, the author suggests certain defects in current practices and offers a key for use with numerous species.

DISEASES OF PLANTS

Department of plant pathology, T. F. MANNS and J. F. ADAMS (*Delaware Sta. Bul. 141 (1925), pp. 24–30, fig. 1*).—A continuation of investigations of pox in sweet potatoes has shown that the disease is caused by an organism resembling *Actinomyces poolensis* and not by a slime mold, as previously reported (E. S. R., 36, p. 544). The ability of the organism to produce soil sickness was demonstrated. Four years' work on the control of this disease showed that cover crops, while increasing the total yield of sweet potatoes, did not reduce the amount of disease. Drought was found to increase injury due to pox, and soil reactions higher than pH 6 were associated with increased disease. Inoculated sulfur controlled or reduced black rot, soil stain, and soil rot, but was without effect on wilt caused by Fusarium. Inoculated sulfur was found

to have no deleterious effect on subsequent crops, even when applied at the rate of from 300 to 400 lbs. per acre. Experiments for comparison of the value of sulfur and inoculated sulfur were inconclusive.

Injecting infusions from peach trees infected with yellows or little peach failed to reproduce the diseases in healthy trees. Investigations on the shot hole disease, due to *Bacterium pruni*, were continued, but all attempts to recover the organism from buds of infected wood gave negative results. Later, natural infection was observed both on foliage and fruit of infected trees.

In a study of diseases of cucurbits it was found by inoculation experiments that *Alternaria brassicae nigrescens* is in no manner related to *Macrosporium cucumerinum*, as is often reported.

Observations on pea diseases are reported, from which it appears that *Ascochyta pisi* and *B. pisi*, usually severe in their attacks, were absent or not abundant, and that *Aphanomyces euteiches* was not a disturbing factor in the pea canning area in 1925.

A leaf spot of soy beans, caused by *Septoria glycines*, and downy mildew, *Peronospora sojae*, were found for the first time in the State in 1925. Bacterial leaf spot of soy beans was found to be seed borne.

In tests of spray materials and dusts, dusts gave practically as good control of apple scab as did liquid sprays if the dusting was begun subsequent to the cluster bud or pink stage of blossoming. Cold oil emulsion proved to have good spreading qualities. As an insecticide it was as good as lime sulfur for the control of apple aphis, and it was more economical than some of the proprietary brands of miscible oils.

Studies on the control of grape diseases are said to have shown that the newly tied-up canes are sources of infection rather than the mummified fruits. Spraying campaigns for the control of grape diseases should be arranged accordingly. It is recommended that the first spray should be applied when the new growth is not more than from 0.5 to 0.75 in. in length, followed by a second application when the growth is from 4 to 6 in. long, and a third when from 10 to 20 per cent of the blossoms have opened. The third is considered the most important spray so far as the control of fruit rot is concerned. The fourth spray should be given when 90 per cent of the clusters have completed blossoming, and the fifth when the grapes have attained the size of peas.

Investigations in 1924 showed that the Macrosporium which produces foot rot of tomato is also a cause of a severe leaf blight of that plant. Investigations of this subject are said to indicate that this Macrosporium is the same as that which causes early blight of potatoes. For the control of the disease, the application of Bordeaux mixture is recommended.

[Pathological work at the Michigan Station], G. H. Coons (*Michigan Sta. Rpt. 1924, pp. 202–204*).—In continuation of a study of the specific reaction of pathogens of the Sphaeropsidales, animals were immunized with fungus extracts, and serological tests were made. In some cases immunization was produced, but there was a lack of specificity in the reactions. It is reported that an assistant, M. Carpenter, secured excellent methods of diagnosis in certain groups of fungi by the use of various types of culture media.

In an experiment on the breeding of a strain of Golden Self-Blanching celery resistant to yellows, sufficient seed had been obtained for a test by growers on infected soil.

Bean disease investigations consisted of testing hybrids for anthracnose resistance and a study of bean mosaic. Hybrids of Red Kidney crossed with Robust were tested, but none of the white strains showed any great superiority over Robust.

With potato diseases, previous conclusions regarding leaf disease and seed tuber disinfection were confirmed. A large amount of work on the production of seed stocks free from mosaic and allied diseases through tuber indexing and field roguing was carried on with success.

Laboratory experiments by D. Stewart with various dust disinfectants showed the possibility of disinfecting sugar beet seed balls.

Report of the plant pathologist, C. M. TUCKER (*Porto Rico Sta. Rpt. 1924, pp. 26–29, figs. 3*).—A preliminary account is given of an investigation of coconut bud rot in Porto Rico caused by *Phytophthora palmivora*. Cutting the diseased trees and burning infested crowns appeared to hold the disease in check.

Notes are also given on a root disease of vanilla caused by *Fusarium* sp., on leaf-spotting fungi (*Cercospora* spp. and *Helminthosporium* spp.) occurring on a number of host plants, and on the susceptibility of the Chamaluco variety of banana to wilt (*F. cubense*).

Plant diseases (*South Carolina Sta. Rpt. 1925, pp. 51–55, fig. 1*).—Plant diseases, especially brown rot and scab of peaches and black rot and mildew of grapes, are said to have been less troublesome in 1925 than usual, probably due to an excessively dry season.

The Ascochyta canker of cotton, first reported in the State in 1924, was found again in 1925. Cotton wilt, formerly thought to be confined to the sandy soils of the Coastal Plain of South Carolina, is said to have made its appearance in the heavier soils of the Piedmont region. Considerable work was done on cotton anthracnose, the results confirming conclusions previously announced (E. S. R., 53, p. 750).

A foot and stem blight of garden beans caused by *Macrophoma phaseoli*, a new disease of crepe myrtle, and a bacterial disease of garden peas are briefly described or noted.

Further studies were made of the wild onion disease reported previously (E. S. R., 52, p. 544), and the recovery is reported of some plants when potted and transferred to the greenhouse. Similar behavior was observed at the New York Cornell Experiment Station, which is cooperating in this investigation. Additional evidence was secured which is said to indicate that the disease is slow in getting started in the field, but that when once established it is very destructive.

Report of the mycologist [Kenya Colony] for the period April 1st to December 1st, 1921, J. MCDONALD (*Kenya Colony Dept. Agr. Ann. Rpt. 1921, pp. 123–126*).—A very brief outline of experimentation, routine work, and general observations is prefaced by an account of plant diseases noted for the first time in Kenya Colony, including castor oil plant rust (*Melampsorella ricini*), apple and quince silver leaf disease (physiological causation), almond crown gall, sugar cane mosaic, tea gray blight (*Pestalozzia theae*), and sisal leaf spot (*Leptosphaeria* sp., probably wound parasitic only).

Studies on the physiology of some plant pathogenic bacteria.—VII, Pectic fermentation in culture media containing pectin, F. A. WOLF (*Phytopathology, 13 (1923), No. 9, pp. 381–384*).—In continuation of studies of the author and some of his colleagues on the physiology of plant pathogenic organisms (E. S. R., 46, p. 739), an account is given of the action of several species of bacteria in dissolving the middle lamellae of plants. It is claimed that pectic fermentation may be postulated in culture on media containing pectin. Increase in acidity is considered the criterion by which the presence of pectic enzymes is shown.

A new host for Bacterium malvacearum, J. G. BROWN and F. GIBSON (*Phytopathology, 13 (1923), No. 10, pp. 455–457, figs. 2*).—As a result of inoculation experiments the authors have established the parasitism of *B. malvacearum*, the cause of angular leaf spot on Arizona wild cotton (*Thurberia thespesioides*).

Another economic host of Bacterium solanacearum, C. G. WELLES and E. F. ROLDAN (*Phytopathology, 13 (1923), No. 11, pp. 488–491, figs. 2*).—The authors record the wilting of *Chrysanthemum coronarium* in the Philippines due to attacks of *B. solanacearum*.

A species of Olpidium parasitic in the roots of tomato, tobacco, and cabbage, M. BENSAUDE (*Phytopathology, 13 (1923), No. 10, pp. 451–454, figs. 5*).—A brief account is given of the occurrence of *O. brassicae* on roots of tomatoes in a greenhouse at the Wisconsin Experiment Station. Tobacco and cabbage plants grown in the same soil become parasitized by the same organism.

The problem of breeding nematode-resistant plants, W. S. MALLOCH (*Phytopathology, 13 (1923), No. 10, pp. 436–450, figs. 2*).—The author describes a method of growing nematodes and host plants together to determine host susceptibility to the parasite.

As a result of cross-inoculation experiments it is believed that there are no physiological or biological strains of *Heterodera radicicola*. Lists are given of a considerable number of plants from various localities that were found to be infested with nematodes, and also lists of varieties and strains of cantaloupes and tomatoes susceptible to nematode attack.

Studies on Ophiobolus graminis Sacc. and the take-all disease of wheat, R. J. DAVIS (*Jour. Agr. Research [U. S.], 31 (1925), No. 9, pp. 801–825, pls. 6, figs. 5*).—The results are given of laboratory, greenhouse, and, to a limited extent, field investigations of the disease of wheat known as take-all and its causal agent. Three single spore strains of the organism received, respectively, from New York, Arkansas, and Oregon were studied in detail, and inoculation experiments were performed on three varieties of wheat. Some differences were found in the strains of *O. graminis*. The form obtained from New York produced perithecia and matured ascospores, while the strains from Oregon and Arkansas did not sporulate. Some differences in temperature relations were observed, the optimum temperature for the growth of the New York strain being between 19 and 24° C., while for the Oregon and Arkansas strains the optimum temperature was between 23 and 24°. The optimum H-ion concentration for the New York strain was pH 6, for the Oregon strain pH 6.8, and for the Arkansas strain pH 6.8 and 7.6.

As a result of the author's experiments, it is concluded that the ascospores and probably the mycelium of the parasite overwinter in plant refuse in the soil. The different varieties of wheat were found to be equally susceptible to infection during the entire growing period of the plants, but it is believed that the plants are most susceptible in the seedling stage. Infection was never obtained on any part of the plants above the soil line.

The bleaching of the aboveground portions of infected plants is considered to be due to the cutting off of the food materials and water supply, and possibly to the presence of toxic substances.

Influence of soil temperature and moisture on infection of young wheat plants by Ophiobolus graminis, H. H. MCKINNEY and R. J. DAVIS (*Jour. Agr. Research [U. S.], 31 (1925), No. 9, pp. 827–840, pl. 1, figs. 7*).—The authors give an account of studies of the influence of temperature and moisture on the

development and parasitism of *O. graminis*, the experiments having been performed under controlled conditions as afforded by the soil temperature apparatus of the Wisconsin Experiment Station. It was found that *O. graminis* is a vigorous root and tiller-base parasite, and also that infection is greatly influenced by soil temperature and soil moisture. Infection and injury were favored by moderately low temperatures (12 to 16° C.) and by fairly high soil moistures (70 to 80 per cent).

From individual experiments it was found that the temperature optima shifted from time to time, regardless of the moisture content of the soil. This is believed to indicate that other factors which were not so well controlled as soil temperature and soil moisture may have a decided influence on the occurrence of the disease, and that the temperature optimum probably extends over a range of from 4 to 6°.

A serious disease of wheat caused by Sclerotium rhizodes in Idaho, C. W. Hungerford (*Phytopathology, 13 (1923), No. 10, pp. 463, 464*).—A serious disease of wheat in the spring of 1922 was observed in Fremont County, Idaho, the cause of which was determined as *S. rhizodes*. The recurrence of the disease in 1923 was not observed.

The barberry eradication campaign in Montana, H. E. Morris and W. L. Popham (*Montana Sta. Bul. 180 (1925), pp. 24, figs. 7*).—The relation of the common barberry to stem rust of wheat is pointed out, and an account is given of the campaign for barberry eradication carried on in Montana in cooperation with the U. S. Department of Agriculture. According to the publication, the entire State has been covered in a preliminary survey. Farm to farm surveys have been made of much of the area, and many thousands of barberry bushes have been destroyed.

Cause of sunscald of beans, H. G. MacMillan (*Phytopathology, 13 (1923), No. 8, pp. 376–380*).—In 1918 the author described a sun scald of beans without attempting to show what constituent of sunlight was responsible for the injury (E. S. R., 39, p. 455). Subsequent investigations were carried on under greenhouse conditions in which bean plants were subjected to artificial heat and light, and it is claimed that the injury is caused by light of short wave length, which kills the epidermal cells of the pods and on leaves causes symptoms similar to mild mosaic. No symptoms of true scald were produced by heat.

The propagation of clover leaf bacteriosis and its control by partial soil sterilization [trans. title], R. Ciferri (*Staz. Sper. Agr. Ital., 57 (1924) No. 4–6, pp. 165–177*).—Clover leaf bacteriosis, acknowledged to be due, as shown by Jones et al. (E. S. R., 50, p. 348), to *Bacterium trifoliorum*, is said to attack most severely *Trifolium pratense* and less severely *T. incarnatum*. The spores survive exposure to the digestive processes of cattle. As a preventive, partial soil sterilization is thought from preliminary tests to be practicable.

Bacterial spot of cowpea and Lima bean, M. W. Gardner and J. B. Kendrick (*Jour. Agr. Research [U. S.], 31 (1925), No. 9, pp. 841–863, pls. 6*).—A detailed account is given of studies of the spot of cowpeas caused by *Bacterium vignae*, the occurrence of which was previously noted (E. S. R., 49, p. 246), and attention is called to the identity of the organism *B. viridifaciens*, described by Tisdale and Williamson as causing a spotting of Lima beans (E. S. R., 50, p. 44), with the organism which causes the spot of cowpeas.

The bacterial spot of cowpeas is said to be characterized by reddish-brown lesions on the leaves, stems, pods, and seeds. In addition to all the varieties of cowpeas tested, the host species include catjang, hyacinth bean, asparagus bean, adzuki bean, velvet bean, Lima bean, bush Lima bean, dwarf sieva bean, and the common weed, tick trefoil (*Desmodium canescens*).

Cowpea pod infection is said to result in seed infection, the seeds from infected pods giving rise to infected seedlings when planted in sterilized soil.

As means of control the authors recommend the selection of seed from disease-free pods, or the use of seed two or three years old, and crop rotations.

A new leaf spot disease of onion and garlic, C. B. WELLES (*Phytopathology, 13 (1923), No. 8, pp. 362–365, pl. 1, fig. 1*).—A severe leaf spot of onion and garlic that was observed at the College of Agriculture, Los Banos, P. I., in 1922, is described. The disease is attributed to *Cercospora duddiae* n. sp., a technical description of which is given. Spraying with Bordeaux mixture is recommended for the control of the disease.

Irish potato disease investigations, 1924–25, L. O. GRATZ (*Florida Sta. Bul. 176 (1925), pp. 23, figs. 6*).—A preliminary report is given of two years' investigations of potato diseases in Florida. The diseases in the State are said to be identical with those occurring in Northern States where most of the seed potatoes are grown. The investigations reported include studies on Alternaria spots, seed-piece decay, late blight, and their control, and tests of strains, varieties, and sources of seed potatoes.

The author found that *A. solani* not only attacked the aboveground parts of a potato plant, but that it can also produce lesions on the tubers. It is believed that the fungus is carried over in this manner, and that early blight is spread from such infections.

Seed-piece decay is considered to be due to a Fusarium, which is a common soil organism in the region and is not introduced on the seed tubers. Dusting the cut tubers with sulfur, lime, cement, or plaster of Paris did not give any perceptible control of the disease. The treatment of seed tubers with a solution of corrosive sublimate is said to have been quite effective in reducing losses due to *Corticium vagum*.

For the control of late blight, dusting with commercial lime copper or spraying with Bordeaux mixture to apply equal amounts of copper gave economical control. Sprayed rows gave somewhat larger percentages of No. 1 tubers than dusted ones, and both gave higher yields of marketable tubers than the checks.

In the tests of strains, varieties, and source of seed tubers, wide variations were observed not only in uncertified and certified stocks, but in varieties from different sources.

The blackleg disease of the potato: On the relationship of Bacillus atrosepticus and Bacillus solanisaprus, S. G. PAINE and H. CHAUDHURI (*Phytopathology, 13 (1923), No. 8, pp. 359–361*).—From a study of the thermal death point of the organisms and the results of inoculation experiments, the authors conclude that *B. atrosepticus* and *B. solanisaprus*, both of which produce diseases of potato tubers, are distinct species.

Studies on spindle-tuber of the potato, A. H. GILBERT (*Potato Assoc. Amer. Proc., 11 (1924), pp. 101, 102*).—Field observations made throughout Vermont and cultural studies carried on at the Vermont Experiment Station are held to show that potato degeneration is caused by spindle tuber, certain features outlined constituting the symptom complex peculiar to the strains under consideration. Transmission of the degeneracy is noted.

Relation of environment to spindle-tuber symptoms, H. O. WERNER (*Potato Assoc. Amer. Proc., 11 (1924), pp. 102–106*).—"In certifying and selecting seed potatoes, the relation of environmental conditions to plant and tuber characteristics in both normal plants and plants affected with spindle tuber and other virus diseases must be given consideration. Spindle tuber symptoms in tubers are less distinctly developed at low soil temperatures with low soil moistures and on light (sandy) soils than under conditions approaching the opposite of these. Different dates of planting may cause tuber develop-

ment to occur when combinations of these conditions are very different, with correspondingly different effects upon tubers produced."

Seven years' tests with commercial dusting materials against potato blight, E. Wallace (*Potato Assoc. Amer. Proc., 11 (1924), pp. 86–92*).—During 1917–1924, comparative spraying and dusting tests were made with the principal types of fungicides offered for sale to control potato blight. This was done to determine not the best methods but the best fungicides. The results are tabulated as obtained by the use of standard Bordeaux mixture, copper-lime dusts, Bordeaux dusts, and other dusts. Blight control on the dusted plats was generally poor as compared with that obtained by the use of Bordeaux mixture.

High pressure spraying machinery, D. Dean (*Potato Assoc. Amer. Proc., 11 (1924), pp. 84–86*).—Experience during 20 years in potato spraying, often under very severe conditions, indicates that thorough and very late spraying with Bordeaux mixture keeps late blight usually well below 0.5 per cent; also that this treatment almost perfectly controls rot in storage. However, severe losses may result from neglect of any of the necessary factors, care in mixing, heavy pressure, frequent spraying, thoroughness in application, and continuance of spraying until all vines are dead whenever there is any danger of late blight infestation.

Time-temperature curves for killing potato tubers by heat treatments, F. M. Blodgett (*Phytopathology, 13 (1923), No. 11, pp. 465–475, figs. 3*).—In connection with investigations for the control of mosaic and leaf roll of potatoes, the author conducted experiments in heating tubers in a hot-water bath and in a hot-air oven to determine the temperature and time relations required for killing the tubers. Data are presented showing the time required to kill tubers when exposed to temperatures ranging from 35 to 120° C. (105 to 248° F.), and a formula is given for estimating the time-temperature relations.

Further studies on potato seed treatment, J. C. Gilman and I. E. Melhus (*Phytopathology, 13 (1923), No. 8, pp. 341–358, figs. 5*).—As a result of three years' experiments the authors found that hot formaldehyde, cold formaldehyde, and mercuric chloride were practically equally efficient in controlling the black scurf of potatoes caused by *Rhizoctonia solani*. Bordeaux dust applied to tubers was without value, and the control by Bordeaux mixture was so slight as to make its use of little value.

It is claimed that the efficiency of the treatment may be readily determined either by the weight of the crop or by a count of the percentage of diseased progeny resulting from the treatment.

The use of organic mercury dust for disinfecting seed potatoes, W. H. Martin (*Potato Assoc. Amer. Proc., 11 (1924), pp. 116–121*).—Good results were obtained from tests with chemical dusts for control of potato scab. Definite recommendations regarding replacement of the present formaldehyde or mercuric chloride liquid treatments with organic mercury dusts must await the results of further testing.

Nickel and copper dusts proved unsatisfactory for seed potato disinfection, the former preventing germination and the latter reducing germination and yield.

Organic mercury dusts, 4 oz. per bushel, controlled scab, as well as did a 1–1,000 mercuric chloride 45-minute treatment, with about the same slight decrease of yield. The 2 oz. per bushel treatment with No. 2 organic mercury dust gave as good control as did 4 oz.

The results indicate that the dust treatments may be made after the tubers are cut, with neither loss of efficiency nor injury to the seed piece. Apparently

the sclerotia on Rhizoctonia-diseased potatoes are killed as effectively by the No. 2 dust as by the mercuric chloride treatment.

Discovery of curly leaf of sugar beets in the Argentine Republic, P. A. Boncquet (*Phytopathology, 13 (1923), No. 10, pp. 458–460*).—The presence of curly leaf of sugar beets in Argentina is reported. The leafhopper *Eutettix tenella*, considered the carrier of the disease, was also found.

Field control of tomato mosaic, M. W. Gardner and J. B. Kendrick (*Phytopathology, 13 (1923), No. 8, pp. 372–375, fig. 1*).—From a study of perennial weeds that are known to be winter carriers of tomato mosaic infection it was found that eradication of the mosaic-carrying perennial weeds in and near the plant beds early in the season and in and around the fields during June and July apparently held tomato mosaic in check.

Early stages of crown gall, M. T. Cook (*Phytopathology, 13 (1923), No. 11, pp. 476–482, figs. 14*).—Inoculation experiments performed with castor bean seedlings and Bryophyllum are said to show that the stimulation caused by the crown gall organism is not confined to the cambium and that parenchyma tissues are especially subject to it. The galls are said to start as more or less spherical masses in the parenchyma cells, which are stimulated into activity. The growth is quite different from the callus growth following wounds. The organism producing the galls is believed to exert considerable influence in cells with which it is not in contact. The xylem of the fibrovascular bundle may be distorted as a result of a wound or as a result of pressure exerted by growing gall tissues, but it is considered doubtful if it is otherwise modified. The author claims that tumor strands may develop in the pith or in the cortex in close contact with (or possibly involving) the cambium. The latter strands were found to lie between the phloem of the two adjacent fibrovascular bundles.

A method for the control of crown gall in the apple nursery, M. B. Waite and E. A. Siegler (*U. S. Dept. Agr., Dept. Circ. 376 (1926), pp. 8, figs. 8*).—The authors describe a method for use in the propagation and growing of root-grafted apple trees in nurseries by which the attacks of crown gall may be greatly reduced. The method consists of selection of seedlings free from hairy root and crown gall infection and treating the stocks and scions with a solution of Semesan during the various operations involved in grafting.

Apple bitter-rot cankers in the eastern United States, J. W. Roberts (*Phytopathology, 13 (1923), No. 10, p. 461*).—In a previous publication (E. S. R., 39, p. 551) the author reported his inability to find bitter rot cankers in apple orchards in the eastern United States. A brief note is given of the presence of cankers on apple twigs collected in northern Georgia in 1921. The cankers are said to have been typical in every respect, and inoculation experiments on apples produced bitter rot.

The adherence to foliage of sulfur in fungicidal dusts and sprays, R. W. Thatcher and L. R. Streeter (*New York State Sta. Tech. Bul. 116 (1925), pp. 3–18, fig. 1*).—A series of investigations on the comparative efficiency of sulfur-containing dusts and sprays for the control of apple scab is said to have offered an opportunity for a study of the extent to which the fungicidal materials remained in active form on the leaves.

There was found to be a mechanical loss of from 89 to 93 per cent of sulfur during the first week when applied as dust, while for the same period from 34 to 75 per cent of the free sulfur was lost from sprayed foliage. As a consequence, after the first week dusted trees held less sulfur than sprayed ones.

The addition of Kayso to sprays is said to have decreased the mechanical loss during the first week, after which there was no evident beneficial effect.

After the first week, when the mechanical loss of sulfur had about ceased, the decrease in the amount of sulfur adhering to the foliage, whether dusted or sprayed, was fairly regular, and it appeared to be independent of rainfall. It is claimed, in general, that in order to secure the same amount of sulfur adhering to foliage for the continuous chemical change in gaseous form, it will be necessary to apply a much larger dosage of sulfur in the form of dusts than in the form of lime-sulfur spray.

From the results of their experiments and from the theory of the probable method of fungicidal effects of sulfur, it is considered likely that the fungicidal properties are increased in proportion to the fineness or smallness in size of particles in which the material exists at the time of its initial application or deposition on the foliage.

The Melanconis disease of the butternut (Juglans cinerea), A. H. GRAVES (*Phytopathology, 13 (1923), No. 10, pp. 411–435, pls. 2, figs. 5*).—A description is given of a slowly progressive disease of the butternut tree that is said to be widely distributed in North America. The disease is characterized by a succession of new, rather short branches which die in their turn, developing farther and farther down the main branches or leaders. In the last stages of the disease the tree is marked by the bare, gray, weathered wood of dead branches in the upper part, giving a characteristic stag-headed aspect to the tree.

The cause of the disease is said to be *Melanconis juglandis* n. comb., the conidial form of which is *Melanconium oblongum*. An amended description of the fungus is given. In addition to the butternut the fungus attacks the Japanese walnut *J. sieboldiana*, and it has been reported as occurring also on *J. nigra* and *J. regia*.

Notes on the occurrence and growth of cankers of Endothia parasitica, N. R. HUNT (*Phytopathology, 13 (1923), No. 8, pp. 366–371*).—During the years 1913–1915 the author conducted experiments on the possibility of controlling chestnut blight by spraying the trees with Bordeaux mixture and lime sulfur. Subsequent to these experiments a study was made of the rate of growth of the cankers and their spread to adjoining trees. The benefit derived from spraying was so slight that the result was in no case commensurate with the cost.

Helminthosporium heveae in Sumatra, C. D. LA RUE (*Phytopathology, 13 (1923), No. 11, pp. 485–487*).—In 1911 Bancroft stated that there was no record of the occurrence of *H. heveae* in the Federated Malay States (E. S. R., 26, p. 451), and Petch suggests that the fungus is confined to young trees and does not cause severe damage (E. S. R., 28, p. 246). The author's observations in Sumatra in 1917–1920 are said to show that *H. heveae* is more or less widespread in the whole of the eastern rubber plantation area. It was found to usually infest nurseries where Hevea trees were planted, but in 1919 it attacked mature trees also. The spores of the fungus in Sumatra were found to be somewhat smaller than those reported by Petch in Ceylon.

Rose diseases caused by fungi, J. RAMSBOTTOM (In *The Enemies of the Rose. Westminster, Eng.: Natl. Rose Soc., 1925, new ed., pp. 111–165, pls. 7, figs. 5*).—This part of the National Rose Society's handbook on the insect and fungus pests of the rose deals systematically with rose diseases, the causal organisms, and remedial measures.

ECONOMIC ZOOLOGY—ENTOMOLOGY

Control of mammals injurious to agriculture in Kansas, G. E. JOHNSON (*Kansas Sta. Circ. 120 (1925), pp. 10, fig. 1*).—This is a brief practical summary of control measures for injurious mammals in Kansas.

The life of the bird, F. von Lucanus (*Das Leben der Vögel. Berlin: August Scherl, 1925 pp. 429, pls. 19, figs. 136*).—This is a popular account.

Sanctuaries for birds and how to make them, H. J. Massingham (*London: G. Bell & Sons, 1924, pp. [5]+160, pls. 8, figs. 18*).—This is a practical account, dealing with the subject under the headings of personal or private sanctuaries (pp. 3–77) and public sanctuaries (pp. 79–156).

Permanent bird houses, G. Califf (*Milwaukee: Bruce Pub. Co., 1924, pp. 64, figs. [112]*).—Plans and descriptions are given of many types of bird houses.

The birds of Florida, H. H. Bailey (*Baltimore: Williams & Wilkins Co., 1925, pp. XXI+146, pls. [78]; rev. in Auk, 43 (1926), No. 1, p. 105*).—This is a popular and scientific account of the 425 species and subspecies of birds that are now and that have been found within the State and its adjacent waters, with special reference to their relation to agriculture. The work is illustrated with 76 full page four-color plates figuring over 480 birds, by G. M. Sutton, and with an outline map of the State showing areas and a topographical drawing of a bird.

Birds of Massachusetts and other New England States, I, E. H. Forbush (*[Boston]: Mass. Dept. Agr., 1925, vol. 1, pp. XXXI+481, pls. 49, figs. 68*).—In this, the first of a three-volume work, the water, marsh, and shore birds of Massachusetts are considered. Each form is dealt with under the headings of descriptions, measurements, molts, field marks, voice, breeding, range, distribution in New England, and seasonal occurrence. Discussions of their bionomics under the heading of haunts and habits and of their economic status follow. Colored plates illustrating the species, by L. A. Fuertes, are included.

Trapping ducks for banding, F. C. Lincoln (*U. S. Dept. Agr., Dept. Circ. 362 (1926), pp. 20, figs. 18*).—This is a description of methods employed in the banding of migratory waterfowl for the study of their migration and life history.

Report of the section of entomology [of the Michigan Station], R. H. Pettit (*Michigan Sta. Rpt. 1924, pp. 209–219, figs. 13*).—This is a brief report of the occurrence of, and work of the year with, several of the more important insect pests.

In control work with *Leucotermes flavipes*, which is becoming more and more destructive to public buildings and dwellings in the North Central States, kerosene has given quite successful results. *L. flavipes* is destroyed by drilling holes and injecting kerosene into nests that can be found, and the fumes will also penetrate through its workings and kill many individuals at a distance. The addition of 1 or 2 oz. of pyrethrum to each gallon of kerosene increases the efficiency of the kerosene quite materially.

At Lansing, the fruit of plums was gnawed by *Cryptorhyncus lapathi* sufficiently to start rotting. In control work for the white-pine scale (*Chionaspis pinifoliae*), tests were made of scalecide at the rate of 1 to 25 and 1 to 20 of water and of Sunoco spray oil at the rate of 1 to 30 and 1 to 25 of water. Satisfactory results were obtained with 3,000 6-year-old pine trees and a number of large trees by thoroughly drenching them at a pressure of 250 lbs. A large proportion of the mature scales were found parasitized by a new species of Prospaltella.

An outbreak of *Vanessa cardui* surpassing all previous records in Michigan occurred on Canada thistles in fields of oats during late June. The larvae also devoured burdock and sometimes nettles, and occasionally plantain and elm, but in no case did they molest valuable crops unless starved to it, when peppermint and soy beans were accepted as food. The violet sawfly (*Emphytus canadensis*), which eat holes in and entirely devour the leaves of violets, at-

tacked pansies at Pontiac. Good control was effected in the case of the apple flea-weevil (*Orchestes canus*) by the application of a spray beginning on May 9, when the weevils first appeared. A powdered lead arsenate was used at the rate of 2 lbs. to 50 gal. of water, at a pressure of 300 lbs.

A new pest of currants, the currant stem girdler (*Janus integer*), was a source of injury in Kent County. Cutting off a few inches of the tip and destroying by fire is said to be the only remedy known. The presence of the grape mealybug (*Pseudococcus maritimus*) in vineyards at Lawton, an account of which, by Gentner, has been noted (E. S. R., 54, p. 354), is referred to. A flea-beetle of the genus Longitarsus, an account of which, by Gentner, has been noted (E. S. R., 52, p. 758), was a source of injury to peppermint at Mentha.

Insect pests (*South Carolina Sta. Rpt. 1925, pp. 44–51, figs. 5*).—This is a general discussion of the insect pests of the year and means for their control, particularly of the Mexican bean beetle and insecticides.

Insect enemies [of the rose], F. V. THEOBALD (In *The Enemies of the Rose. Westminster, Eng.: Natl. Rose Soc., 1925, new ed., pp. 14–109, pls. 12*).—This is a general account of the important rose insects in Great Britain.

Natural enemies of prickly pear and their introduction into Australia, W. B. ALEXANDER (*Aust. Inst. Sci. and Indus. Bul. 29 (1925), pp. 80, pls. 13*).—A considerable part of this account (pp. 34–64) deals with insects attacking prickly pear.

Insecticides, fungicides, and weed killers, E. BOURCART, rev. by T. R. BURTON (*London: Scott, Greenwood & Son, 1925, 2. Eng. ed., rev. and enl., pp. XII+431, figs. 13*).—This is a revision and enlargement of the English edition of the work previously noted (E. S. R., 29, p. 341).

Studies on Nicotiana rustica as a source of a nicotine for insect control, D. E. HALEY, O. OLSON, and F. L. FOLLWEILER (*Jour. Econ. Ent., 18 (1925), No. 6, pp. 807–817*).—Studies conducted, a brief account of which has been noted (E. S. R., 54, p. 353), have led to the following conclusions:

"The ground tobacco, when used alone, with water, or with basic lime compounds was not efficient as an insecticide in the control of aphids. If sufficient quantities of basic materials were mixed with the ground tobacco, it was found that the addition of water resulted in the evolution of nicotine, the rate of evolution depending in a large measure on the amount of water added. A mixture containing 5 parts of tobacco, 5 parts of hydrated lime, and 3 parts of water proved to be very efficient as an insecticide under laboratory and field conditions. Notwithstanding the relatively large amount of water present, it was found that such a mixture could be applied to vegetation by the use of power blowers and with no especial difficulty. Mixtures of the ground tobacco, water, and basic lime compounds could be kept in sealed containers for a relatively long period of time with no apparent loss of toxicity. These experiments warrant that some consideration be given to the possibility of cultivating *N. rustica* for its nicotine content alone and to utilize it in the form of an insecticidal dust."

Calcium cyanide fumigation, S. N. GORÉ (*Indian Jour. Med. Research, 13 (1925), No. 2, pp. 287–299, figs. 2*).—This is a detailed report of 12 experiments conducted since 1915 at the Bombay Bacteriological Laboratory, in which it was found that a concentration of 50 parts of hydrocyanic acid gas per 100,000 of air and half an hour's exposure is sufficient to kill rats, fleas, and bedbugs. Mosquitoes are very susceptible to this gas, and a concentration of about 6 parts per 100,000, with an exposure of a few minutes, kills them. One oz. of calcium cyanide when used per 100 cu. ft. in air-tight spaces gives a lethal

concentration, which is attained in about 1.5 hours and maintained for about 4 hours. If calcium cyanide is used in the open, or even in spaces not made sufficiently air-tight, lethal concentration is not attained and there is failure to kill insects and rodents. Diffusion of hydrocyanic acid gas generated from the calcium cyanide sprinkled in narrow channels dug out in the ground was too poor to be effective all along the channel.

The effect upon the vitality of seed corn of temperatures that will kill seed-infesting insects, H. W. Alberts and W. P. Flint (*Jour. Econ. Ent., 18 (1925), No. 6, pp. 771–776*).—Tests conducted with corn infested by various species of common seed-infesting insects have shown that temperatures of at least 125° F. for three hours are necessary to kill all stages of these insects. Such temperatures have a detrimental effect on the germinating power of both sweet and field corn where the moisture content of the corn is above 15 per cent. Apparently there is no injury to corn of either kind where the moisture content is between 2 and 15 per cent.

The effect of temperature on protozoan and metazoan parasites, and the application of intra-intestinal thermal therapy in parasitic and other affections of the intestines, D. de Rivas (*Amer. Jour. Trop. Med., 6 (1926), No. 1, pp. 47–73*).—The author has found that protozoan and metazoan parasites are rather sensitive to the action of heat, being killed in about 10 minutes at 45° C. (113° F.) and in a few minutes at 47°.

Attractant and poisoned bait experiments on the pellucid grasshopper, H. R. Painter, C. L. Fluke, and A. A. Granovsky (*Jour. Econ. Ent., 18 (1925), No. 6, pp. 818–823*).—In experiments conducted with various materials as poisons and attractants in the control of *Camnula pellucida* Scudd., no striking differences were observed in the various baits as to attractive qualities or killing power.

Physiological variation in the snowy tree cricket, Oecanthus niveus DeGeer, B. B. Fulton (*Ann. Ent. Soc. Amer., 18 (1925), No. 3, pp. 363–383, figs. 6*).—This is a contribution from the Iowa State College, based in large part upon data obtained by the author while at the Oregon Station.

The author finds that there are two races of this tree cricket in Oregon, differing only in their habits, one form living in bushes and the other in trees. The habits of the tree-inhabiting race differ but slightly from those of the same species in the Eastern States, while the bush-inhabiting form in Oregon is a distinct physiological variety. The characteristic song and oviposition habits of the two forms in Oregon remain fixed when the adults of one form are confined to the normal environment of the other. The females of each form select plants for egg laying which best meet the requirements of their characteristic mode of oviposition.

Reference is made to physiological varieties of other species of insects.

Pycnoscelus surinamensis Linnaeus (Orthoptera); on its nymphs and the damage it does to rose bushes, A. N. Caudell (*Ent. Soc. Wash. Proc., 27 (1925), No. 8, pp. 154–157, figs. 2*).—The author records injury by this roach to rosebushes, particularly to young plants, at Providence, R. I., through its eating the bark from the stems 2 in. beneath the surface of the ground. At North Wales, Pa., it chewed off the bark of mature rose canes from a point well underground to a distance of several inches above ground. The insect is said to be fast becoming a pest with which rose growers will have to contend.

Life history of Pundaluoya simplicia, the cholam leafhopper, Y. Ramachandra Rao (*Madras Agr. Dept. Yearbook 1923, pp. 27–31*).—Under the name *P. simplicia* Dist. the author reports upon a fulgorid, which, as stated in a

footnote, has since been determined by D. L. Crawford to be identical with *Dicranotropis maidis* Ashm. The insect infests cholam and maize and sometimes cumbu in the Madras Presidency, and is probably distributed throughout India and Ceylon.

Potato aphids, E. M. Patch (*Maine Sta. Bul. 323 (1925), pp. 9–36, pls. 3, figs. 2*).—The author presents brief summaries of information on the potato aphid and the green peach aphid, the only aphid forms of world-wide distribution now known that commonly attack the potato plant in numbers sufficient to cause serious injury directly by their feeding operations. An account is also given of the buckthorn aphid (*Aphis abbreviata* Patch), a third species apparently also of world-wide distribution, which is often present on the potato, frequenting especially the underside of the lower leaves. It is pointed out that all three of these species are capable of spreading certain potato diseases under experimental conditions, and may need to be reckoned with wherever potatoes are grown for seed purposes. The life cycles of the three species are indicated in diagrammatic form. Accounts of the potato aphid (E. S. R., 43 p. 159; 47, p. 159) and *A. abbreviata* (E. S. R., 52, p. 253), by the author, have been noted. The paper includes a brief account of control measures, a key to the aphids attacking the Solanaceae, a list of aphids recorded on plants of the nightshade family, and a partial bibliography.

In the account of *Myzus persicae* (Sulz.), the author points out that, while its primary or overwintering host is the peach and in America its greatest activities are in the peach zone, north of this area it is carried through on other species of Prunus, small and weak spring colonies being the rule. Record is made of the finding of a feeble spring colony on wild or Canada plum (*P. nigra*) near Caribou, on June 27, 1924. The species is also undoubtedly carried through on house and greenhouse plants by a succession of viviparous generations. When the climate is mild enough to admit, the viviparous generations are continued out doors, and in such localities the overwintering eggs play a much less vital part in its life history.

Controlling Pseudococcus comstocki Kuw. on catalpa, W. S. Hough (*Jour. Econ. Ent., 18 (1925), No. 6, pp. 823–827*).—*P. comstocki* is said to be the principal insect enemy of *Catalpa bungei* in northern Virginia, eastern West Virginia, and through the Cumberland Valley to Hagerstown, Md. The ovicidal properties of various materials were tested over a period of two years at the Virginia Experiment Station, and the first two generations were controlled by a dormant treatment of hand cleaning and spraying. The third generation caused most of the injury in August and September and was controlled by mechanical methods only.

Effectiveness against the San Jose scale of the dry substitutes for liquid lime-sulphur, W. S. Abbott, J. J. Culver, and W. J. Morgan (*U. S. Dept. Agr. Bul. 1371 (1926), pp. 27*).—This is a report of experiments conducted in four States, extending over a period of three years. They include 39 tests with dry calcium sulfur, 13 with dry sodium sulfur, and 11 with dry barium sulfur, conducted under practical orchard conditions and varying degrees of infestation on both apple and peach trees. The work has led to the conclusion that commercial dry calcium, sodium, and barium sulfurs, even when used at strengths much greater than ordinarily employed, do not furnish a satisfactory control of the San Jose scale.

Specificity in bacterial disease with special reference to silkworms and tent caterpillars, R. W. Glaser (*Jour. Econ. Ent., 18 (1925), No. 6 pp. 769–771*).—The silkworm disease bacillus, which is also pathogenic for tent caterpillars, produces a specific disease in the two insects when their food is con-

taminated with the microorganism. This disease can not be reproduced by contaminating the food with bacteria of general occurrence or with those pathogenic in other insect species. By contaminating the food with other bacteria a few deaths are obtained, but these deaths in no way resemble those produced with the silkworm bacillus and epidemics can not be initiated. All insects investigated (silkworms, tent caterpillars, armyworms, grasshoppers, roaches, etc.) succumb in a few days when inoculated with living cultures. Such a procedure, however, throws little light on the nature and course of a naturally acquired infectious disease in insects.

Contributions on the natural history of the green oak tortrix in Alemtejo, Portugal [trans. title] (*Mem. e Estud. Mus. Zool. Univ. Coimbra, 2. ser., No. 1 (1924), pp. 45, pls. 7*).—The several contributions here presented are as follows: A Note on the Biological Phenomena Which Precede Oviposition by *Tortrix viridana* L. (pp. 11–13), A Preliminary Note on the Biology of *Tortrix viridana* (pp. 15–20), and Observations on the Injury of *Tortrix viridana* to the Buds of Cork Oak (pp. 21–24), all by A. F. de Seabra and F. A. dos Santos Hall; A Preliminary Note on the Chorographical Distribution of *Tortrix viridana* and *Cacoecia xylosteana* (L.) (pp. 25–27) and Some Typical Systems of Shelter Constructed by the Caterpillars (pp. 29, 30), both by A. F. de Seabra; A List of Insects Considered to be Parasites of *Tortrix viridana*, by F. A. dos Santos Hall (pp. 31–36); Observations on an Experimental Cultural Treatment for the Destruction of the Eggs of *Tortrix viridana*, by A. F. de Seabra and F. A. dos Santos Hall (pp. 37–40); and a bibliography relating to these Lepidoptera (pp. 41–45).

The South Andaman coconut slug-caterpillar (Thosea unifascia Wlk.), P. V. Isaac (*Agr. Jour. India, 20 (1925), No. 5, pp. 373–379, pls. 2*).—This is an account of a limacodid, the caterpillars of which feed voraciously and at times may occur in such large numbers in coconut plantations that many trees over a restricted area may be almost entirely defoliated.

On the life history and structure of the early stages of Simuliidae (Diptera, Nematocera), I, II, I. M. Puri (*Parasitology, 17 (1925), Nos. 3, pp. 295–334, pls. 2, figs. 6; 4, pp. 335–369, figs. 15*).—Following a brief introduction and remarks concerning the genus Simulium, on the habits of the larvae and pupae, and on the eggs, this article deals chiefly with the morphology of the larvae and pupae (pp. 303–333, 337–364). A key for the determination of species of British Simuliidae from full grown larvae and pupae is also included (pp. 335–337).

Notes on the taxonomy and natural relationships of fleas, with descriptions of four new species, H. E. Ewing (*Parasitology, 16 (1924), No. 3, pp. 341–354, pl. 1, fig. 1*).—The several parts of this account deal, respectively, with (1) the poultry-infesting species of Ceratophyllus, namely, *C. gallinae* (Schr.), *C. niger* Fox, and *C. gibsoni* Fox (pp. 342–344); (2) the genus Odontopsyllus Bak. (pp. 345, 346); (3) recent and old hypotheses as to the origin of fleas (pp. 347–349); and (4) descriptions of four new species (pp. 350–354).

The relation of flies and fly sprays to milk production, S. B. Freeborn, W. M. Regan, and A. H. Folger (*Jour. Econ. Ent., 18 (1925), No. 6, pp. 779–790, fig. 1*).—This is a contribution from the California Experiment Station, in which an initial attempt is made to measure the decrease in milk production produced under controlled conditions by infestations of the house, stable, and horn flies. During one month's confinement in heavy infestations, the loss was 1.4 per cent with horn flies, 3.33 per cent with house flies, and 9.26 per cent with stable flies. Continuing the infestation of flies but spraying daily

with a bland nontoxic oil type of spray, cattle infested with stable flies lost 21.0 per cent and with horn flies 13.1 per cent. Sprayed with a combination of the same oil and a pyrethrum extract spray, the controls without flies lost 4.3 per cent, and cattle infested with stable flies 12.4 per cent.

Benzene as a larvicide for screw worms, D. C. PARMAN (*Jour. Agr. Research* [*U. S.*], *31* (*1925*), *No. 9, pp. 885–888*).—The author reports upon tests made of numerous chemicals, which have led to the conclusion that, as larvicides for the screw worm (the larva of the dipteran *Cochliomyia macellaria* Fab.), benzene, ethyl ether, chloroform, carbon tetrachloride, and xylene have the same rank. The larvae in each case, when moistened with these materials, became inactive in an average of 40 seconds. In dry wounds, the time required to kill the larvae is practically the same for each and is about the same as that for the larvae moistened with the chemicals. Where the wounds do not have good drainage, the larvae are killed very slowly with benzene, ethyl ether, and xylene, as these materials float on the blood and serum, and it has been found that the larvae can live submerged in the wound from 20 to 30 minutes. Chloroform and carbon tetrachloride sink into the blood and serum and mix with it, and all larvae are killed nearly as quickly as in a dry wound. To kill the larvae quickly with benzene in such wounds, it is necessary to dry the wound first with cotton or a cloth and to apply the benzene immediately.

It is pointed out that most wounds infested with screw worms have a considerable flow of fresh blood and serum. When the wound is dry it is not so attractive to flies, and for this reason any chemical that has a tendency to laxate the wound is not desirable. In benzene was found an insecticide that acts as a styptic, the blood flow stopping in most cases as soon as all of the larvae are killed. When benzene is applied, and the wound takes on a dry, pale appearance, which lasts from 5 to 10 minutes or more, a wound dressing and fly repellent which adheres well to all parts should be applied, making a perfect coating which should continue the styptic effect. In no case has any indication of injury to the tissues been observed after an application of benzene, and the wound usually heals soft and dry without scabbing or cracking. On clean, smooth wounds there is hardly ever any dead tissue after treatment.

The author finds that in the treatment of more than 3,000 cases of worms in cattle, sheep, goats, hogs, dogs, and chickens, there has never been any noticeable toxic effect of benzene on the animal. Only 5 of 2,843 cases of infested animals treated with it under the author's personal observation died, and in 3 of the 5 which succumbed, the worms had entered the body cavity or were present in the head of the animal and had affected the nervous system.

Sheep blow-fly control: A new method, B. SMIT (*Union So. Africa Dept. Agr. Jour., 11* (*1925*), *No. 5, pp. 455–458, fig. 1*).—The author describes a new maggot trap, which is built in the form of a trough. The advantages of this trap are: (1) The carcasses are simply and easily disposed of, and there is no immediate need to poison, burn, or bury them; (2) the carcasses are reduced to a state in which they are readily combustible, if it is desired to burn the remnants; (3) the flies are drawn away from the live sheep and enticed to lay their eggs where these will ultimately be destroyed as maggots; (4) the maggots may perhaps be made use of as poultry food; and (5) with certain facilities, it may be possible to augment the supply of the beneficial parasite *Nasonia brevicornis*, since the maggots may be allowed to pupate in cages from which no developing flies can get out, but from which the parasites can escape.

Repellents and larvicides for the screw worm and other flies, F. C. Bishopp, R. C. Roark, D. C. Parman, and E. W. Laake (*Jour. Econ. Ent., 18 (1925), No. 6, pp. 776–778*).—The authors describe methods and list the more promising repellents. The repellent action of tear gas has been demonstrated, though no satisfactory diluent has been found.

The striped cucumber beetle (Diabrotica vittata Fab.), J. S. Houser and W. V. Balduf (*Ohio Sta. Bul. 388 (1925), pp. 237–364, figs. 28*).—This is a summary of knowledge of *D. vittata*, based upon a review of the literature and investigations conducted by the author at the Marietta field station during the years 1919, 1920, and 1921. A reduction in the area devoted to cucurbit culture of about one-fifth during the last 10 to 15 years, due in large part to the striped cucumber beetle, emphasized the need for such investigation. The account, which is monographic in nature, deals with the history of the insect, its distribution, morphology, biology, natural enemies, and control measures, in connection with a bibliography of 169 titles.

There are two broods annually in Ohio of this, the most serious enemy of cucurbits in the United States. The overwintering adults become active in April, and for a few weeks feed especially on flowers of hawthorn and other Rosaceae. In May and June they appear on cucurbits, where mating and oviposition begin promptly and continue until late in August, when the last of the overwintered beetles die. The summer brood develops from June 30 to August, reproduction taking place at once and continuing to the middle of October, when all adults have succumbed. During September and October the second or winter brood appears, but does not reproduce, the beetles feeding on any available cucurbits or even Compositae, chiefly asters and goldenrod, until the cold weather reduces them to inactivity.

Injury is caused to cucurbits by the feeding of the adults and larvae, the latter working chiefly at the underground parts of the stems. As has been shown by Rand and Enlows (E. S. R., 35, p. 546), the adults carry the cucurbit wilt disease, an estimated loss of more than $75,000 being occasioned each year in Ohio.

At Marietta more than half the beetles appear to be killed by natural enemies, including three internal parasites. Control experiments were conducted with more than 30 materials, including (1) nonarsenical repellents, (2) poisoned dusts, (3) arsenical sprays, and (4) miscellaneous treatments. Sprays containing Bordeaux mixture, arsenate of lead, and arsenate of lime gave good control and large yields. However, dusts were found to be more desirable for use under Marietta conditions, since they are applied easily and quickly with simple, inexpensive devices. When hydrated lime was used as a carrier of arsenate of lead or arsenate of lime, the stunting of plants was overcome to a small extent. Land plaster proved the best carrier because of its physical properties and especially its fertilizer value. Lead arsenate with land plaster gave good control and yield of cucumbers, but was found to be secondary to arsenate of lime used with land plaster in the proportion of 1 to 20 lbs. When applied to cucumbers 12 times a season at the rate of from 30 to 60 lbs. per acre per application, it gave splendid results as a cucumber beetle repellent and as a stimulator of plant growth. Very little cucurbit wilt was found where this combination of dusts was used.

The life history of Diabrotica vittata Fab. in Iowa (Chrysomelidae, Coleoptera), H. L. Sweetman (*Jour. Econ. Ent., 18 (1925), No. 6, pp. 795–807, fig. 1*).—In work conducted at the Iowa Experiment Station, two generations of the striped cucumber beetle were found to occur in Iowa, the first completing its development in 37 days and the second in 51 days.

Studies on the embryology of Bruchus quadrimaculatus Fab., A. BRAUER (*Ann. Ent. Soc. Amer., 18 (1925), No. 3, pp. 283–312, figs. 31*).—This is a contribution from the zoological laboratory of the University of Oklahoma on the development of the larva within the egg.

The coffee berry borer (Stephanoderes coffeae Hag.) in Brazil, I, II [trans. title], A. M. DA COSTA LIMA (*Chacaras e Quintaes, 30 (1924), Nos. 4, pp. 316–319; 5, pp. 413–416, fig. 1*).—A summary of information on this enemy of coffee, which includes a description of a new species under the name *S. fallax*.

The coniferous trees of the United States, with the scolytid (ipid) beetles said to attack them, W. J. CHAMBERLIN (*Pan-Pacific Ent., 2 (1925), No. 1, pp. 23–35*).—Seventy-one host trees are listed, with the scolytids attacking them.

Control of the saw-toothed grain beetle in rasins.—A preliminary report, J. C. HAMLIN and C. BENTON (*Jour. Econ. Ent., 18 (1925), No. 6, pp. 790–795*).—The authors record the preliminary steps taken to control raisin packing-plant infestations of the saw-toothed grain beetle.

Weevil biological work (*South Carolina Sta. Rpt. 1925, pp. 10–20, 83, figs. 7*).—This is a brief account of biological studies of the boll weevil, by F. A. Fenton, E. W. Dunnam, et al., at the Pee Dee Substation and in the vicinity of Florence. Hibernation records of 19,427 weevils during 1924–25 showed 5.88 per cent surviving in the open field and 10.98 per cent in pine wood flats. Emergence from hibernation in the field cages was completed June 17, while those in the pine woods continued to emerge until July 1. Of weevils placed in hibernation cages in September, 1.7 per cent survived, as compared with 3.63 per cent survival in cages stocked October 1 to 15, 12.17 per cent in cages stocked October 16 to 31, and 13.62 per cent in cages stocked November 1 to 13. Many different materials were used in the cages to protect the weevils. Cotton stalks packed into the cages seemed to give better protection than any other material tried, 11.4 per cent of the weevils surviving when this material was used, as compared with 7.6 and 5.1 per cent for pine straw and Spanish moss, respectively.

Weevils were placed in large field cages over young cotton as soon as the plants were up, to determine the longevity of the weevil prior to fruiting of the cotton. This was done weekly from April 23 until cotton began to fruit. Of the weevils that emerged from hibernation from April 23 to May 9, 100 per cent were dead by June 2, when cotton began to fruit generally, and from 72 to 90 per cent of those caged afterward were dead on June 2. Field counts showed an average of 2 overwintered weevils per 100 plants in each of 12 plats on May 21. This number gradually increased throughout June, until on June 24 there were 4.2 weevils per plat. Since first generation weevils had not developed at that time, it was evident that there was a gradual increase of the overwintered weevils in many fields during this period due to new arrivals from hibernating places. There were four generations during the year.

In investigations of weevil migration, as determined by screens set up in the fields, it was found that the general movement began in 1925 about July 17, as compared with August 26 in the previous year. The greatest movement of weevils from field to field took place in 1925 between July 24 and August 7.

Field plat tests with poisons, continued along the lines of the previous year, were reported in Bulletin 223, previously noted (E. S. R., 53, p. 759).

Productive bee-keeping, F. C. PELLETT (*Philadelphia and London: J. B. Lippincott Co., 1923, 3. ed., rev., pp. XIV+302, pl. 1, figs. 134*).—This is a third, revised edition of the work previously noted (E. S. R., 36, p. 158).

Diseases of the honey bee and treatment (*N. Y. State Dept. Farms and Markets Circ. 282 (1925), pp. 10, fig. 1*).—This is a practical summary of information on the subject, including papers on the Method of Treatment of American Foul Brood, by W. D. Wright and C. Stewart (pp. 2–4) and European Foul Brood, by C. Stewart (pp. 4, 5). The New York laws relating to bees are appended.

Buckeye poisoning of the honey bee, G. H. Vansell (*California Sta. Circ. 301 (1926), pp. 12, figs. 12*).—Experimental work has shown definitely that wherever the California buckeye, a tree which grows to be 40 ft. high, is abundant serious injury to bees occurs during years when a deficiency in top soil moisture exists, or when, for any reason, other plants fail to produce enough nectar to be more attractive to the honey bee than *Aesculus californica*, which is deep-rooted and not seriously affected by drought. The California buckeye is confined to a foothill zone extending around the Sacramento and San Joaquin Valleys, the zone reaching the ocean at various places from Mendocino to Ventura Counties and extending eastward into the Antelope Valley of Los Angeles County. As yet no poisonous substance has been isolated from either buckeye nectar or buckeye honey, though undoubtedly there is a poisonous material present, and it seems probable that the material is a very unstable glucoside. As pointed out, buckeye nectar and pollen may not alone be responsible, for droplets of sap exuding from punctures made by a small plant bug, *Urbisea solani* Heid., in the leaves, blossom buds, and tender twigs, are collected by the bees and may contribute to the poisoning. It is recommended that where trouble has occurred bees be moved away during the buckeye blossoming period.

Notes on acarine or Isle of Wight bee disease, C. Samman and J. B. Gatenby (*Roy. Dublin Soc. Sci. Proc., n. ser., 17 (1924), No. 46, pp. 357–363, pls. 2, fig. 1*).—This account is based upon work, extending over about one year, by the zoological department of Trinity College, Dublin.

In an experimental attempt made to determine how soon infection of the hive would take place after a parasitized bee had gained access to a clean stock, it was found that the gravid female gains access to the trachea very early and rapidly commences to lay eggs. The experimental treatment of diseased stocks with drugs in food during the winter months is considered to have given encouraging results.

The pine needle mite, a new enemy of the pines, Eriophyes pini Nalepa (family Eriophyidae), E. Walther (*Jour. Econ. Ent., 18 (1925), No. 6, pp. 830–836*).—A report of studies of this enemy of pines in Golden Gate Park, San Francisco. Spraying experiments have given some promise, a 10 per cent miscible oil spray being indicated as most productive of results.

ANIMAL PRODUCTION

Genetics in relation to livestock breeding, F. A. E. Crew (*Highland and Agr. Soc. Scot. Trans., 5. ser., 37 (1925), pp. 146–166*).—A popular account of the application of the findings of research in genetics to practical animal breeding.

Silage for fodder in western India, E. J. Bruen (*Bombay Dept. Agr. Bul. 120 (1924), pp. 11, pls. 5*).—A brief account of the use of silage during the eight months' dry period in western India, with directions for the production and storage of silage.

Inspection of commercial feedstuffs, P. H. Smith, F. J. Kokoski, et al. (*Massachusetts Sta. Control Ser. Bul. 32 (1925), pp. 33*).—The usual report of the official inspection of commercial feeds in Massachusetts for the year

ended September 1, 1925, giving the guaranties and the analyses as found and other related information (E. S. R., 52, p. 866).

Sixth annual report division of feed inspection for the year 1924, H. A. Halvorson (*Minn. State Dairy and Food Comn., Div. Feed Insp. Ann. Rpt., 6 (1924), pp. 187, figs. 3*).—This consists mainly of data as to the composition of feeding stuffs officially analyzed during the calendar year 1924 and a list of the brands with their ingredients on sale January 31, 1925 (E. S. R., 51, p. 571).

Meats and meat products, W. H. Tomhave (*Philadelphia and London: J. B. Lippincott Co., 1925, pp. IX+418, figs. 184*).—The slaughtering and cutting of meat from the various classes of animals and the production and curing of various meat products are described, with related information.

Second experimental shipment of store cattle to Great Britain, G. B. Rothwell (*Canada Expt. Farms, Anim. Husb. Div. Rpt. 1924, pp. 3–8*).—Three lots of 20 steers each, averaging, respectively, 1,095, 1,170, and 1,274 lbs. per head, were selected from pastures of the Central Experimental Farm for an experimental shipment to Great Britain as store cattle. The three lots lost an average of 64, 75, and 74 lbs. per head, respectively, during the shipment to Montreal, but gained 54, 105, and 50 lbs., respectively, while in the stockyards. The cattle arrived in England on a poor market and were ordered to be slaughtered immediately as fat cattle. An average of 6.56, 7.01, and 7.43 cts. per pound was received for the animals in the different lots when the expenses had been paid. All animals dressed 58 per cent. The condition and quality of the meat and carcasses are discussed with relation to the breeding and types of the steers, as well as other factors influencing the profit expected from such shipments. It is pointed out that the present high transportation rates took 27 per cent of the value of the animals. There is also room for improvement in the breeding and finish of stock for overseas shipment.

[Experiments in beef production at the South Carolina Station] (*South Carolina Sta. Rpt. 1925, pp. 67, 68, 82, fig. 1*).—The experiments previously noted (E. S. R., 52, p. 567) were repeated.

Velvet beans and cottonseed meal for fattening calves.—One lot of calves averaging 400 lbs. in live weight made an average daily gain of 2.07 lbs. per head in a 70-day test when receiving a ration of shelled corn, oats, cottonseed meal, and corn silage. Another lot of similar calves receiving whole velvet beans in the pod instead of cottonseed meal made an average daily gain of 2.04 lbs. per head. The feed cost per 100 lbs. of gain on the latter ration was calculated at $8.50 as compared with $9.67 on the former ration. It is noted that the calves receiving velvet beans had better appetites and sleeker coats than those receiving cottonseed meal.

Wintering beef cattle at the Coast Station (pp. 67, 68, 82).—The feed costs of wintering the purebred Aberdeen Angus herd from December 3 to February 26 on cottonseed meal, crab grass, and sorghum silage were estimated at $15.50 for mature cows, $12.38 for 2-year-old heifers, and $9.98 for yearling heifers. The different lots of cattle made the following average daily gains: 0.60 0.55, and 0.54 lbs., respectively.

Rations for fattening lambs (*South Carolina Sta. Rpt. 1925, p. 68*).—Various supplements to a ration of mixed soy bean and grass hay and corn silage were compared for fattening lambs. In this experiment the most rapid gains were made by a lot receiving shelled corn and cottonseed meal, followed in order by another lot receiving soy bean meal. The most economical gains were made by the lambs receiving cottonseed meal, with velvet beans ranking second. A fifth lot received peanut feed.

[Swine feeding experiments at the Delaware Station], A. E. TOMHAVE (*Delaware Sta. Bul. 141 (1925), pp. 10–12*).—The results are reported of experiments conducted in continuation of those previously noted (E. S. R., 52, p. 871).

Alfalfa hay for brood sows.—Even better results were obtained in the use of alfalfa leaves gathered from the barn floor for wintering brood sows than when alfalfa hay was used in the earlier experiments. The sows consumed an average of 2.35 lbs. of alfalfa leaves daily.

Protein suplements for growing fattening pigs.—The third year's comparison of tankage and fish meal has been completed, and the combined results show that an average daily gain of 1.12 lbs. was made with tankage as compared with 1.26 lbs. on the fish meal ration. When the former supplement was given 397.5 lbs. of concentrates were required per 100 lbs. of gain, and 367.7 lbs. of concentrates were required when the latter supplement was fed.

In another experiment, tankage, cracked soy beans, and soy bean meal were compared as supplements to a ration of hominy and middlings for growing fattening pigs. Ten pigs were full-fed with a mineral mixture in each lot for 71 days. The average daily gains with the different supplements were tankage 1.25 lbs., cracked soy beans 1.05 lbs., and soy bean meal 1.07 lbs. The cracked soy bean lot required 26.3 per cent and the soy bean meal lot 8 per cent more concentrates than the tankage lot per unit of gain. The pigs receiving the soy bean products apparently did not consume sufficient minerals from the self-feeder to offset the deficiency of these products.

[Feeding experiments with swine at the South Carolina Station] (*South Carolina Sta. Rpt. 1925, pp. 63–66, 90, figs. 2*).—The results of four experiments are reported in continuation of those previously noted (E. S. R., 52, p. 569).

Soy bean and peanut forage for hogs.—Thirty-five pigs were divided into 3 lots for this test. One lot was fed corn and tankage in dry lot, while the other 2 received 2 per cent corn rations with mature soy bean or peanut forage, respectively. During the 56 days' grazing period, average daily gains per head were made as follows: Dry lot feeding 1.41 lbs., soy bean forage 1.47 lbs., and peanut forage 1.62 lbs. The pigs on soy beans were finished on corn and tankage. Throughout the entire test those fed in dry lot made an average daily gain of 1.49 lbs. as compared with 1.65 lbs. for those fed on soy bean forage. Five pigs each from the soy bean lot were tested for hardness of fat at Beltsville, Md., at 28-day intervals after the grazing period. In the first shipment 1 pig killed hard and 4 medium hard. In the second shipment 1 killed hard, 2 medium hard, and 2 medium soft. After 84 days' hardening on the corn and tankage, 3 killed medium hard and 1 medium soft.

Velvet beans for hogs.—Forty hogs averaging 115 lbs. in weight were divided into 4 lots and used for comparing various methods of feeding velvet beans. On the check ration, consisting of corn and tankage fed in dry lot, an average daily gain was produced of 2.27 lbs. at a calculated cost of $9.51 per 100 lbs. of gain. A lot receiving shelled corn and velvet beans in dry lot made an average daily gain of 1.81 lbs. at a calculated cost of $11.04 per 100 lbs. of gain. Another lot similarly fed except that the velvet beans were soaked made an average daily gain of 1.67 lbs. at a calculated cost of $11.06 per 100 lbs. of gain. The fourth lot, which hogged down a field of velvet beans, made an average daily gain of 0.66 lb. per pig at a calculated cost of $8.26 per 100 lbs. of gain.

Protein supplements to corn for hogs.—In a repetition of this experiment with 65 pigs averaging 63 lbs. in live weight divided into 7 lots, a mixture of soy bean meal and fish meal fed with corn produced the maximum rate of gain, 1.91 lbs. per head daily, at a minimnm feed cost, $9.82 per 100 lbs. of gain. Snpplements of fish meal and a mixture of peanut feed and fish meal to the

corn ration each produced an average daily gain of 1.88 lbs. per pig at calculated feed costs per 100 lbs. of gain of $10.61 and $10.35, respectively. The average daily gains produced by the other supplements were as follows: Tankage 1.60 lbs., peanut feed 1.44, soy bean meal 1.41, and peanut meal 1.20 lbs. The calculated feed costs per 100 lbs. of gain were higher than for the other supplements. The more rapid and more economical gains accompanying the feeding of combinations of plant and animal protein are pointed out.

Hogging down forage crops at the Pee Dee Station (pp. 66, 90).—Three lots of 10 pigs each were used in 3 series of trials. Corn and tankage in dry lot was given to 1 lot in each series. In the first series peanuts hogged down plus a 2 per cent corn ration produced the most rapid gains, but peanut forage alone produced cheaper gains. In the second series soy beans hogged down with a 2 per cent corn ration produced the most rapid and economical gains when compared with the pigs fed in dry lot and with another lot receiving sweet potato forage plus tankage. In the third series corn and velvet beans hogged down produced more economical gains than when this forage was supplemented with a limited amount of tankage.

Pig feeding: Indoor versus outdoor fattening, W. G. R. PATERSON (*Highland and Agr. Soc. Scot. Trans., 5. ser., 37 (1925), pp. 86–92*).—In continuing the studies of outdoor and indoor pig feeding (E. S. R., 50, p. 371), 2 groups of 8 pigs each from strains which have been reared and bred for at least 5 generations out of doors were selected. The average live weight in the beginning of the experiment was 47 lbs. The group fed out of doors had access during the first 12 weeks of the experiment to 0.5 acre of forage consisting of rape, vetch, peas, oats, and beans, rotated. During the last 8 weeks of the experiment they were fed indoors. The basal ration of both lots consisted of corn meal, wheat middlings, barley meal, and fish meal (2:4:3:1). As the experiment progressed part of the middlings was replaced by corn meal. Whey was separately fed at the rate of 2 qt. per pound of grain during the entire experiment.

The outdoor pigs made an average gain of 158.25 lbs. per head during the 20 weeks as compared with 176 lbs. by those confined indoors. The average dressing percentages were 77.8 and 79.1 for the outdoor and indoor fed pigs, respectively. The outdoor lot consumed 3.64 lbs. of feed per pound of gain as compared with 3.28 lbs. by the lot fed indoors. The quality of the bacon of both groups was satisfactory, and no taints from the fish meal were apparent.

Report on a pig feeding experiment conducted at the college farm, Kilmarnock, during season 1924, W. G. R. PATERSON and J. COCHRANE (*West of Scot. Agr. Col. Bul. 104 (1925), pp. 159–177*).—This pig feeding experiment reported in this bulletin was conducted to study the possibility of replacing fish meal in the ration by decorticated peanut meal and minerals, and also to determine the effect of supplementing the ration with cod-liver oil.

The basal ration fed to all lots consisted of corn meal, wheat middlings, and barley meal (2:4:3). The amount of corn was increased and the wheat middlings decreased as the experiment progressed. Four lots of 8 pigs each were selected for making the test. One lot received an addition of 10 per cent of whitefish meal to the basal ration, while a second lot received 10 per cent of decorticated peanut meal and 2 per cent of sterilized steamed bone flour. Two other lots were similarly fed except that 0.5 oz. of cod-liver oil was supplied per pig daily. Whey was also given to all lots at the rate of 2 qt. per pound of grain, but both were fed separately.

The weights of each pig at 2-week intervals during the 19 weeks of the experiment are given. The average gains per pig during the entire experiment and the grain required per pound of gain were, respectively, for the lots receiving the compared feeds, fish meal 171.1 and 2.74 lbs., peanut meal and minerals 174 and 2.70, fish meal and cod-liver oil 172.9 and 2.72, and peanut meal, minerals, and cod-liver oil 176.4 and 2.66 lbs. The dressing percentages of these lots averaged 77.8, 77.4, 77.7, and 76.7 per cent. The calculated returns were somewhat greater from the pigs receiving peanut meal, but were reduced in both cases when cod-liver oil was given.

The quality of the bacon was determined when fresh and after storage and in cooking tests. These results indicate that the cooked bacon from the pigs fed on cod-liver oil developed an oily flavor after having been stored for some time, but no undesirable flavors were imparted by the other feeds.

Experimental work [of the poultry division of the Dominion experimental farms], F. C. ELFORD (*Canada Expt. Farms, Poultry Div. Rpt. 1924, pp. 9–30, figs. 2*).—The results of the following experiments are briefly reported in continuation of previous work (E. S. R., 52, p. 570):

Vitamin feeds for brooder chicks.—Seven hundred chicks were divided into 14 lots of 50 each immediately after removal from the incubator, and the 40 best in each lot were selected 4 days later for making a comparison of various additions to the basal ration. All but one lot received a standard chick scratch hand-fed and a standard mash dry-fed in hoppers with a wet mash once daily. Ingredients of the mash consisted of equal parts of bran, middlings, corn meal, and oat flour, and 0.5 part of beef meal. Grit, greens, milk, and water were available. The following supplemental feeds were compared: 0.5 part of wheat germ added to the mash, 0.5 part of rice polish added to the mash, 1 oz. of Larro yeast added to 10 lbs. of mash, 1 oz. of Fleischmann's yeast added to 10 lbs. of mash, 1 oz. of tomato pulp daily in wet mash, 1.5 tablespoonfuls of cod-liver oil daily in wet mash, and 2 oz. daily of raw liver finely chopped in wet mash. Other pens received combinations of cod-liver oil with raw liver, Larro yeast, Fleischmann's yeast, wheat germ, or rice polish, in amounts as fed in the above pens. A further pen also received Ful-O-Pep growing mash in place of the standard mash. The results are tabulated in detail, showing the weights, mortality, and condition of the chicks. The preliminary results indicate that the addition of certain of the feeds, such as cod-liver oil, raw liver, and yeast, has proved beneficial from the standpoint of development, mortality, and the prevention of leg weakness.

Vitamin feeds for rearing.—The birds used in the preceding experiment were continued after 3 weeks of age on similar rations, but the lots were reduced to 25 chicks and some were discontinued. The supplementary feeds in this experiment consisted of wheat germ as 11 per cent of the dry mash, Larro yeast as 1 per cent of the dry mash, tomato pulp in amounts of approximately 2 teacupfuls per day, cod-liver oil in increasing amounts from 2 tablespoonfuls per pen to 0.5 tablespoonful per bird daily, raw liver in sufficient amounts to moisten the wet mash, and cod-liver oil and raw liver both fed as above. Data are given showing the weights, condition, mortality, and feed consumption during the first 7 weeks when both cockerels and pullets were included in the lots and also during the succeeding 3-week period with pullets only. For the entire 10 weeks of the test the highest percentage gains were made by the birds receiving Larro yeast, followed closely by those on raw liver and cod-liver oil, respectively. Only 1 bird died in the 3 pens receiving

cod-liver oil, raw liver, and cod-liver oil and raw liver, respectively. The smallest amount of feed per unit of gain was consumed when the ration contained raw liver as a supplement.

Cod-liver oil in the treatment of leg weakness in chicks.—In testing the value of cod-liver oil as a curative agent for leg weakness, 15 chicks suffering from this affliction were given a basal ration plus cod-liver oil for 14 days. The amount varied from 1 teaspoonful per chick on the first day to 1 teaspoonful for 5 chicks per day. Though the chicks were down badly on their legs and unable to walk at the start of the experiment, most of them had shown decided signs of improvement by the third day, and all except one, which was in a very serious condition at the start, were able to run around normally by the eleventh day. The exceptional chick was normal by the end of the experiment. The birds developed in a normal manner during the succeeding 3 months when placed on a standard ration, with no evidence of a recurrence of leg weakness.

Feeds for winter egg production.—In one series of experiments, 4 pens of 15 White Leghorn pullets each were selected for comparing supplements of 20 per cent beef meal, 20 per cent tankage, 20 per cent liver tankage, and sufficient raw liver to moisten the mash in the rations of laying pullets. The results for the cost of feed and egg production for each month from November to April, inclusive, and the fertility and hatchability of the eggs are given. The tankage apparently gave the highest production of eggs at the lowest cost per dozen, and was followed in order by liver tankage, beef meal, and raw liver. Outstanding hatching results, however, were obtained with the raw liver supplement.

In another series of experiments with 6 lots of similar birds, comparing various sources of green feed and substitutes for winter egg production, the birds receiving mangels produced the largest number of eggs at the lowest feed cost, followed in order by the lots receiving clover leaves, sprouted oats, Epsom salts, cabbage, and no green feed. The best hatching results were, however, obtained in the pen receiving Epsom salts, fed at the rate of 2 oz. per day. In a further comparison of substitutes for green feed, the best egg production was obtained by the lot receiving clover meal, followed in order by the lots receiving tomato pulp, alfalfa meal, and clover leaves. The best hatching results were obtained with clover leaves, but the hatchability of the eggs from the birds fed tomato pulp was exceptionally low.

Preserving and storing eggs.—In a series of experiments on the preservation of eggs treated and handled by various means and placed under ordinary storage conditions with a Canadian storage company in June, the eggs were graded in December after removal from storage. Two 30-doz. cases were used for a study of the value of dipping eggs in a boiling solution of wax and oil, according to the directions of a commercial process. The results showed that eggs processed by this means were decidedly better than the nonprocessed eggs, as 93 per cent were graded as extras when taken out of storage, as compared with 81 per cent of the nonprocessed eggs. In another experiment, in which commercial eggs were used instead of new-laid eggs, similar results were obtained in that 10 per cent more processed eggs graded as extras than the nonprocessed eggs. There was practically no difference in the quality of the eggs removed from storage when the eggs had been stored in farmers' cases than in the ordinary commercial ventilated case. The quality of clean and dirty eggs was practically equal, while washed eggs were nearly 50 per cent inferior to both types. Slightly better results were obtained from the use of clean flats and fillers as compared with dirty flats and fillers. A 14

per cent advantage in the grade of eggs was shown from storing with the small end down as compared with the small end up.

A complete summary of the above experiments, in which part of the eggs were stored in a natural state while the rest were treated by the commercial process mentioned, is given. It was found that 80 per cent of the treated eggs, consisting of 195 doz., were graded as extras as compared with 66 per cent of the nontreated eggs consisting of a like number. About 30 doz. of each kind were tested for flavor, and the results indicate that the processed eggs were far superior to the others.

The nutritive requirements of poultry, J. B. Orr, M. Moir, A. Kinross, and G. S. Robertson (*Scot. Jour. Agr., 8 (1925), No. 3, pp. 263–269*).—The results are reported of three cooperative experiments (E. S. R., 52, p. 273), in which a mineral mixture of calcium phosphate, calcium carbonate, sodium chloride, sulfur, ferric oxide, and potassium iodide (10:4:4:1:1:0.1) was added to the basal mash of one pen in each experiment, while a control pen received the basal ration only. Lots receiving fish meal were also included in two of the experiments.

One of the experiments was conducted during 12 months at the Rowett Institute, with 3 lots of 14 Leghorn pullets each having the run of a rough pasture. Oyster shell and flint grit were available. The lot receiving the basal mash consisting of a mixture of wheat offal, ground corn, crushed oats, and bean meal (8:3:3:2) and a scratch grain of equal parts of wheat, oats, and corn produced an average of 107.4 eggs averaging 60.1 gm. in weight. Another lot having 5 per cent of the mineral mixture added to the mash produced 178 eggs per hen averaging 58 gm. in weight. The third lot received fish meal in place of the bean meal and no minerals were added. An average of 154.8 eggs was produced by these birds.

In a similar experiment at the West of Scotland College of Agriculture from September to March 28, 3 lots of 12 White Leghorn pullets each were used. The basal ration consisted of wheat offal, corn meal, oatmeal, and blood meal (10:7:5:5). The blood meal was later reduced to 2.5 parts. The grain consisted of equal parts of oats, wheat, and corn. The control pen produced 61.22 eggs per bird as compared with 83.66 eggs for those receiving a 5 per cent addition of minerals to the mash. The third lot, receiving 6 parts of fish meal in place of blood meal, produced 93.7 eggs per bird.

In an experiment at Belfast, 2 lots of 8 pullets each were fed over a period of 5 months, from November to March, the one lot receiving a basal ration only, consisting of a mash mixture of wheat offal, corn meal, and oats (6:2:1) and a scratch grain consisting of equal parts of oats and corn. The control birds produced an average of 53.6 eggs as compared with 67.8 by another lot having 2 per cent of the mineral mixture added to the mash.

The combined results indicated that the mineral supplement had a definite stimulating effect on egg production. This was not only true at the beginning of the laying period, but appeared to be more evident toward the end. Supplementing the rations with fish meal also proved desirable.

An analysis and interpretation of heavy grain feeding, R. R. Hannas (*Poultry Sci., 3 (1924), No. 6, pp. 214–219, fig. 1*).—Data are presented showing the amounts of mash and scratch grain fed monthly in the Vineland and Bergen County, N. J., egg-laying contests, together with the monthly production from November to June, during three years. A study of these results indicates that greater yearly production, better health, and lower mortality accompanied the generous feeding of scratch grain, especially in the fall and winter. Lighter feedings of scratch grain tended to increase mash consump-

tion, which overstimulated egg production, resulting in a dropping off during the summer and following fall.

Mashless rations, J. H. MARTIN (*Poultry Sci., 4 (1924), No. 1, pp. 26–32, figs. 4*).—More complete results of the experiments previously noted (E. S. R., 52, p. 475) are given. It is concluded that mash is not necessary unless it contains a high protein feed. Very satisfactory egg production was obtained without any mash when sour skim milk, liquid buttermilk, condensed buttermilk, or granulated buttermilk was available as a source of protein. Birds receiving corn and sour skim milk only continued in production during the entire year.

Dried yeast product as a supplement to a good poultry laying ration as a means of increasing egg production, A. J. SOUBA, H. C. KNANDEL, and R. A. DUTCHER (*Poultry Sci., 3 (1924), No. 6, pp. 204–213*).—A more complete account of the investigation previously noted (E. S. R., 50, p. 473).

The influence of ultra-violet light on leg weakness in growing chicks and on egg production, J. S. HUGHES, L. F. PAYNE, and W. L. LATSHAW (*Poultry Sci., 4 (1925), No. 4, pp. 151–156, fig. 1*).—A more complete account of the investigation previously noted (E. S. R., 53, p. 274), with similar data for a third group of birds fed out of doors in the bright sunlight. The largest number of eggs were laid by the latter group, but the hatching results were intermediate to the pens receiving and not receiving the ultra-violet light treatment.

The correlation between age at the laying of the first egg and the weight of eggs during the first laying year in White Leghorns, W. A. LIPPINCOTT, S. L. PARKER, and L. M. SCHAUMBURG (*Poultry Sci., 4 (1925), No. 4, pp. 127–140, figs. 3*).—In continuing the studies of the relation of age at first laying to the weights of the eggs at the Kansas Experiment Station (E. S. R., 47, p. 672), the correlations between the age of laying the first egg by 60 White Leghorn pullets and the mean weights of the eggs laid by each during the 12 30-day periods following are reported.

The pullets used were hatched from the latter part of March to the middle of May. No correlation was found between the date of hatching and the age at laying the first egg. The correlation between the age at laying the first egg and the egg weights for the 30-day periods showed considerable variation. The first two were high, 0.666 ± 0.048 and 0.649 ± 0.052. The correlation was progressively lower, but probably significant, during the next 3 periods, 0.428 ± 0.072, 0.314 ± 0.081, and 0.304 ± 0.079. During the sixth to the ninth periods the correlation was very low, 0.079 ± 0.087, 0.196 ± 0.084, 0.096 ± 0.086, and 0.233 ± 0.084, but again became significant in the last 3 periods, 0.371 ± 0.076, 0.483 ± 0.067, and 0.437 ± 0.070, respectively. The mean periodic production was inverse to the degree of correlation.

The average weights of the eggs laid during the different periods by birds starting laying at different ages showed that the birds starting to lay when young never laid eggs as large as those starting laying when older. The mean egg weights for the year for birds starting to lay from 151 to 175, 176 to 200, 201 to 225, 226 to 250, and over 251 days of age were, respectively, 49.82 ± 0.44, 51.39 ± 0.47, 54.26 ± 0.74, 56.44 ± 0.31, and 52.66 ± 1.04 gm. The selected group of 60 birds showed a correlation of 0.447 ± 0.071 between the age of laying the first egg and the mean weight of all eggs laid, and 0.359 ± 0.076 between the age at laying the first egg and the total egg production.

Since the latter was not in conformity with the results of Jull (E. S. R., 52, p. 675) and other investigators, the correlation between the age at laying the first egg and total production was calculated for 240 days for the entire

flock of 124 birds from which the experimental pullets were selected. The correlation for the culled birds was -0.188 ± 0.084.

The correlation coefficients between age of first laying and egg weights in the 30-day periods calculated for the birds in the entire flock that were laying in the different months followed the same general trend as the selected pullets, and in other respects the two sources of data were mainly corroborative.

A study of incubation, E. BURKE (*Montana Sta. Bul. 178 (1925), pp. 3–44, figs. 18*).—*In this study of various physiological processes associated with* incubation, air was drawn from under hens sitting on artificial and hen's eggs and from incubators at the slow rate of 2 liters per hour for 24 hours and analyzed for its carbon dioxide and moisture contents. The temperature of eggs was determined with electric resistance thermometers placed on opposite sides of a perforated receptacle large enough to contain an egg. The calcium and phosphorus percentages in the egg contents and chicks and the entire weights of the eggs were determined at different stages of incubation. The relation of various incubation practices to these factors was also studied.

Tests of the percentages of carbon dioxide and moisture in the air taken from under hens sitting on glass eggs showed that there were larger amounts of both materials present than in the outside air, indicating that a certain amount of carbon dioxide and water are given off by the hen. In these studies the carbon dioxide content remained rather constant, but the moisture present fluctuated with atmospheric conditions. The production of carbon dioxide and moisture was determined daily under 4 pairs of hens sitting on hen's eggs at different seasons of the year. The data are presented in charts, which show considerable variability in the moisture content, but the carbon dioxide increased quite rapidly, especially during the second week, with an observed check in the rate of increase at about the sixteenth day, which appears to be associated with the time of considerable embryonic mortality.

Six tests were conducted with hot-air incubators and three tests with electric incubators at different seasons of the year. These results showed that moisture and carbon dioxide were present in smaller quantities in the artificial incubators than were found under the hens. By closing the ventilators and using wet sand trays it was possible to increase the percentage of moisture and carbon dioxide in electric incubators above that found normally under the hen. The results with carbon dioxide are discussed, and it is shown that the carbon dioxide content of the air in most successful hatches was higher than is generally considered advisable. Under one hen hatching all the fertile eggs the amount went as high as 143 parts per 10,000 parts of air on the twenty-first day, and with the best hatch in the electric incubator there were 165 parts of carbon dioxide per 10,000 parts of air on the nineteenth day. It is suggested that the CO_2 and H_2O may tend to change the $CaCO_3$ of the shell to $Ca(HCO_3)_2$, thus making it more porous and more easily broken by the chick at hatching. The proper amount of moisture for incubation appeared to be from 140 to 150 parts of water per 10,000 parts of air.

In the studies of the loss in weight of eggs, practically identical results were obtained in the electric incubator with moistened sand trays and under hens, the respective averages being 19.84 and 19.56 per cent. Since both moisture and carbon dioxide appear to be important factors in incubation, it is suggested that ventilation be limited in artificial incubators until the air contains as much of these materials as is found in natural incubation.

The temperature studies showed that the eggs under hens averaged rather constantly 102.3° F. at the top of the egg, but the temperature of the lower part of the egg was from 10 to 15° lower. This difference was somewhat reduced as incubation progressed. In tests with artificial incubators, the best results were obtained when the temperature of the top of the eggs was maintained at 102.5° for the first two weeks and not over 103° for the last week, with a rise to 104–106° during hatching. A temporary lowering of the temperature in the incubator was found to reduce the amount of carbon dioxide produced by the embryos and presumably lowered the rate of development.

The studies of the lime and phosphorus contents of eggs showed that the egg contents increased in lime as incubation progressed, but analyses of dead embryos and weak and strong chicks showed no consistent relation between the phosphorus and the calcium content. Variations in the hatchability of the eggs of individual hens were, however, apparent.

The character of Angora hair [trans. title], E. WUCHERER (*Ztschr. Tierzüchtung u. Züchtungsbiol., 4 (1925), No. 1–2, pp. 119–143, pl. 1, figs. 7*).—The results of a comparative study of the morphology and rate of growth of the hair in normal short-haired and Angora types of the rabbit, hare, guinea pig, cat, and goat are reported. The hair of rabbits was classified into four types as A or down type, B or bearded down type, C or awn type, and D or awn or kemp type of which no Angora hair was found. The differences in hairs per unit of skin area, length, thickness, crimp, and appearance on cross section are discussed. The types A, B, C, and D showed respective increases in diameter and length for both Angora and short hairs but decreases in the number per unit of skin area. Type A was a crimped, downy fiber, type B was likewise crimped, but there was also a straight spike on the end. Types C and D were straight throughout their length. The hair on F_1 rabbits from a cross of short and Angora haired individuals was short, but the diameter of the fibers and number on a unit area of skin were nearly like the Angora hair. Further comparisons were made between long and short hair as to the location of the pigment, amount of crimp, size of spike, rate of growth, and density of the hair on the different animals studied. Angora goat hair showed a spiral coiling which was not observed on the other animals.

Report on the fur farms of Canada, 1924, R. H. COATS (*Canada Bur. Statis., Rpt. Fur Farms Canada, 1924, pp. 67*).—Essentially a census of fur farming in Canada during 1924. The text is in English and French.

DAIRY FARMING—DAIRYING

[Experiments with dairy cattle at the Porto Rico Station], D. W. MAY (*Porto Rico Sta. Rpt. 1924, pp. 4–6, fig. 1*).—The crossing of purebred Guernsey bulls with the native dairy cows has been successfully practiced. The milk yields have been increased 47 per cent in the crossbreds and 13.5 per cent in the second generation as compared with the crossbred animals. This practice is recommended for the improvement on the production of the cattle on the island.

In other studies corn, cane, malojilla grass (*Panicum barbinode*), elephant grass (*Pennisetum purpureum*), Guatemala grass (*Tripsacum laxum*), velvet beans, and cane tops have been used as silage crops. Corn was found to make the best silage, with cane next, but, due to the high sugar content of the latter crop, alcohols and acids were produced. This difficulty was also experienced with cane tops when there was too much moisture. When the cane tops were

too dry they did not ferment well. The velvet beans and grasses produced inferior silage. The availability of green fodder throughout the year makes silage production a practice of doubtful value.

Studies in milk secretion.—XV, Guernsey sires' progeny performance for milk yield, butter-fat percentage, and butter-fat, J. W. Gowen (*Maine Sta. Bul. 324* (*1925*), *pp. 37–124, pls. 2, figs. 4*).—This is a study of the advanced registry records of the daughters of Guernsey sires having two or more daughters with records, and has been conducted similarly to the study previously noted for Holstein sires (E. S. R., 47, p. 176). The age correction factors applied in case of the daughters were given in the preceding study of this series (E. S. R., 50, p. 74). The production of the daughters was classified according to octiles instead of quartiles, as in the earlier study of Holsteins. Photographs of certain of the sires having high-producing daughters showed wide divergence in type.

[Experiments in dairy bacteriology at the Michigan Station], G. L. A. Ruehle (*Michigan Sta. Rpt. 1924, pp. 172–177*).—In studies with *Lactobacillus acidophilus*, it was found that clean milk steamed for one-half hour served as a good media for the growth and consumption of this organism. Skim milk often showed a stormy fermentation. A more palatable product for certain individuals resulted from the use of whey, but there were fewer organisms present.

The production of off-flavors and odors in milk by the growth of microorganisms isolated from samples of butter was investigated. The most important observation was the associative action of several organisms, indicating that the production of off-flavors is apparently complicated.

In tests of the enzyme content of dead bacterial cells, it was found that an 8-month-old culture of *Streptococcus lactis* in a chemical solution gave a positive catalase reaction, though no viable cells were demonstrated. The cultures were centrifuged, and the dead cells were washed twice. The supernatant liquid was passed through a Berkefeld filter. Catalase tests were positive when made on the cellular suspension with and without boiling and on the supernatant unboiled liquid, but negative on the boiled supernatant liquid. Oxidase tests of the cellular suspensions were negative. The presence of lipase in the dead cells and in the supernatant liquid was also demonstrated. Caseinase tests were apparently negative.

In investigations by G. K. Wardwell, a small amount of lecithin was added to nutrient broth and the whole inoculated with various organisms and allowed to incubate. The trimethylamine content of the broth was the same after 7 days' incubation as at the time of the inoculation. Certain organisms were shown to clear areas on agar rendered cloudy by lecithin. All plates made with lecithin had a fishy odor, but this was more pronounced with the organisms capable of clarification.

The pH score in milk inspection, L. H. Cooledge (*Michigan Sta. Rpt. 1924, pp. 180–183*).—In continuing the study of the tests of quality in milk (E. S. R., 52, p. 377), it has been found that the pH score checks very closely with the keeping quality of milk. Detailed steps in making the tests are noted.

VETERINARY MEDICINE

Veterinary diagnosis and treatment, G. E. Jorgenson (*New York and London: D. Appleton & Co., 1925, pp. [6]+341*).—This work presents a series of case reports preceded by a brief analysis of the symptomatology and diagnostic procedures, arranged as follows: Diseases of the respiratory organs,

circulatory organs, urinary organs, digestive organs, cerebrospinal system, and of the blood, contagious diseases and epidemiology, and unclassified miscellaneous diseases.

[Report of work with animal diseases at the Delaware Station], C. C. PALMER and H. R. BAKER (*Delaware Sta. Bul. 141 (1925), p. 9*).—The authors consider the agglutination test to be an accurate and dependable means of diagnosis of infectious abortion in cattle. Studies of retained placenta in cattle show it to be a common clinical manifestation of metritis, and that it should, therefore, be treated as a symptom rather than as a distinct disease. In the course of work with roup and white diarrhea of poultry, 23,925 doses of stock and 4,500 doses of autogenic roup vaccine were distributed throughout the State, and 4,380 agglutination tests were made for white diarrhea.

[Annual reports of the Veterinary Service of Egypt for the years 1921–22 and 1922–23], W. LITTLEWOOD and F. E. MASON (*Egypt Min. Agr., Vet. Serv. Ann. Rpts., 1921–22, pp. V+63; 1922–23, pp. IX+59*).—These are the usual annual reports on the occurrence of infectious and parasitic diseases of animals (E. S. R., 47, p. 584). The main reports are followed by reports of the veterinary pathological laboratories, the School of Veterinary Medicine, and the Serum Institute, and statistical data.

***Annual report on the Punjab Veterinary College, Civil Veterinary* Department, Punjab, and the Government Cattle Farm, Hissar, for the year 1923–24**, C. A. BARRON, D. MILNE, R. BRANFORD, and T. J. EGAN (*Punjab Vet. Col., Civ. Vet. Dept.,* [*etc.*] *Ann. Rpt. 1923–24, pp. 4+IV+61+XXIX, pls. 3*).—The occurrence and control of infectious diseases of livestock during the year (E. S. R., 50, p. 480) is included in this account.

Experiments in metallurgical poisoning of animals at Oroya, Peru, at an elevation of 12,200 feet, J. F. MITCHELL (*Jour. Amer. Vet. Med. Assoc., 68 (1925), No. 3, pp. 330–335, figs. 5*).—Experiments conducted in Peru have led the author to conclude that the tolerance of cattle and sheep for arsenic, lead oxide, and flue dust is a matter of general health rather than one of elevation. Three animals, all in pretty good physical condition, took large doses before developing symptoms of poisoning, while a fourth cow, which was severely ill from verminous diseases, died promptly from a relatively small amount of flue dust. Sheep are not as much affected by altitude as cattle. Although 12,200 ft. elevation certainly affects animals, the mere elevation is not as severe a drain on the stamina of an animal as an infestation of worms. Animals with severe infestations of worms can not stand as large doses of flue dust as healthy animals. Sheep in good health withstand and get fat on 4.285 gm. of arsenic, 25.443 gm. of lead oxide, or 13.098 gm. of flue dust, and they can not be given the renguera by feeding these amounts when kept in corrals and fed alfalfa hay.

Ascariasis in preventive medicine, E. B. CRAM (*Amer. Jour. Trop. Med., 6 (1926), No. 1, pp. 91–114*).—A summary of the knowledge of ascariasis in its relation to preventive medicine, with references to the literature.

[Report of work in parasitology at the Michigan Station], W. L. CHANDLER (*Michigan Sta. Rpt. 1924, pp. 198–200*).—An account is given of investigational work with various iodine solutions and iodogenic compounds for the control of roundworms of swine, stomach worms of sheep, ascaridia and cecum worms of poultry, and hookworms and ascarids of silver foxes and dogs, a progress report of which has been noted (E. S. R., 51, p. 79).

In addition to the results there reported, the author has found that warm aqueous solutions of "hyperactive" iodine containing 0.05 per cent iodine may be successfully employed as an enterogastral lavage for dogs and silver foxes.

when administered per rectum under pressure until the vomit contains a large percentage of free iodine in solution, both hookworms and roundworms appear to be completely destroyed, and, following this iodine lavage, much improvement has been observed in gastroenteritis cases.

This iodine solution has also been successfully administered as an enema in several mucous colitis cases in man, the condition of the patient almost invariably clearing up following a series of from three to five enemas. In one case of amebic dysentery in which there were from 18 to 25 bloody stools per day, the number of stools were greatly reduced and blood ceased to be passed after the third enema, while after the fifth enema there was but a single formed stool per day, although all of the amebas were not destroyed by this method of treatment.

A study made of the action of iodine solutions on the eggs of *Belascaris marginata* and *Ascaris lumbricoides*, by M. S. Marshall and the author, is briefly reported upon in tabular form. The author records the discovery of a new stable iodogenic compound (protein iodine compound), which liberates free iodine readily in the presence of oxodizing agents. Solutions of this material have been injected into the heart and abdominal cavity of white rats and into the abdominal cavity of silver foxes and of poultry without the slightest ill effects.

Experiments on the neoarsphenamine treatment of the intestinal protozoal diseases in man have been continued, with the result that more than 200 cases of intestinal protozoal infections, involving some 11 species of protozoa, have been successfully treated.

Critical tests of tetrachlorethylene, a new anthelmintic, with special reference to its use in puppies, A. S. SCHLINGMAN (*Jour. Amer. Vet. Med. Assoc., 68 (1925), No. 2, pp. 225–231*).—A report of investigations of anthelmintics made by Hall and Shillinger with dogs, as previously noted (E. S. R., 54, p. 73), led to the studies here described in detail.

The results of tests made upon 31 canines, both young and old, indicate that tetrachlorethylene is as effective as carbon tetrachloride for the removal of hookworms from dogs, the drug having removed all of the worms present. An average efficiency of 87.7 per cent against ascarids was obtained in 25 cases. The effectiveness of tetrachlorethylene against whipworms was variable, all being removed from one case and none from two others. No effect on tapeworms was noted. The safety of this chemical for puppies was found to be higher than that of carbon tetrachloride, it having been given in doses approximately 20 times the therapeutic dose of carbon tetrachloride for these smaller animals.

Chemotherapy of bacterial infections.—I, Action of acriflavine, gentian violet, and mercurochrome in experimental bacterial infections, E. L. WALKER and M. A. SWEENEY (*Jour. Pharmacol. and Expt. Ther., 26 (1926), No. 6, pp. 461–467*).—The authors report upon carefully controlled experiments, the results of which are considered to substantiate to a certain extent the clinical claims that acriflavine, gentian violet, and mercurochrome have a therapeutic action in bacterial infections, each substance being more or less specific in its chemotherapeutic action. Gentian violet is effective only in staphylococcic infections. Mercurochrome, taking into consideration its action subcutaneously, is more effective in streptococcic than staphylococcic infections. Acriflavine is more effective in staphylococcic than streptococcic infections when brought into direct contact with the bacteria, but is wholly ineffective against both types of infection when distributed by the circulating blood to the bacteria. All three substances, even when brought into immediate contact with the invading bacteria, fai' completely to influence the fatal course

of infections with the Gram-negative Friedlander bacillus, but whether or not they would prove equally ineffective against infections with other Gram-negative bacteria remains to be proved by experiment. The therapeutic action of these chemicals is in general greatly reduced if not wholly destroyed when they are not brought into immediate contact with the infecting bacteria. The notable exception is mercurochrome in streptococcic infections, which, inferior to acriflavine by intraperitoneal injection, is equally though feebly effective by either intraperitoneal or subcutaneous routes.

Tick paralysis, E. A. BRUCE (*Jour. Amer. Vet. Med. Assoc., 68 (1925), No. 2, pp. 147–161, figs. 7*).—It is pointed out that, in addition to carrying the causative organisms of Rocky Mountain spotted fever and tularemia, the tick *Dermacentor venustus* Banks can, under certain conditions, produce a motor paralysis of an ascending type in man, sheep, dogs, and cattle. A single tick may cause paralysis, and in all such cases, so far as known, this tick is always a rapidly gorging female. Recovery is usually rapid and complete, but fatal cases may occur.

Report of the section of animal pathology [of the Michigan Station], E. T. HALLMAN (*Michigan Sta. Rpt. 1924, pp. 170, 171*).—This is a brief report of the work of the year (E. S. R., 52, p. 381), devoted largely to a continuation of the studies of the diseases of the reproductive organs of cattle, a paper relating to which has been noted (E. S. R., 54, p. 172).

The studies indicate that, as a result of the development of the fetal placenta, numerous breaks in the continuity of the maternal epithelium occur which appear to favor the invasion of the maternal tissues by bacteria from the utero chorionic cavity. They indicate that the invasion of the maternal placenta by bacteria partakes somewhat of the nature of wound infection. These observations lead the author to believe that Bang abortion disease, as well as other infectious processes that may cause abortion, is primarily a disease of the maternal placenta; that the fetal tissues are secondarily involved; that essentially, and primarily, the disease is one which lowers the efficiency of the placenta as an organ to provide nutrition to the fetus and transmit its waste products to the maternal circulation; that the phenomenon of abortion depends upon how extensive the alterations of the placenta become; and that disease of the placenta may develop to a certain extent without the development of the fetus being seriously impaired. The author's observations indicate that the essential measures of control are the mating of animals with healthy reproductive organs, an environment for pregnant cattle that minimizes the danger of infectiou subsequent to conception, and a system of herd management that assures the maintenance of the herd on a high plane of health in order that resistance to infections may be high.

Studies of the involution of the uterus indicate that subsequent to parturition the maternal placenta is eliminated through a process of liquefaction necrosis. The process apparently begins at the periphery of the placenta, resulting in a progressive disintegration of the placenta toward the base. It is pointed out that a knowledge of this process is of considerable practical importance in outlining a rational treatment for retained fetal membranes and other puerperal infections.

A study of a Bact. abortus-like organism, I. F. HUDDLESON (*Abs. in Michigan Sta. Rpt. 1924, pp. 184, 185*).—The author reports upon a bacteriological study of an organism closely resembling *Bacterium abortus* culturally, which was first isolated from the lung of a guinea pig in May, 1922. The guinea pig had received an intraperitoneal injection of a strain of *B. abortus* and 20 days later showed clinical symptoms of a respiratory trouble and general emaciation.

The organism, which developed aerobically on liver agar plates streaked with pieces of lung tissue from the guinea pig, proved nonagglutinable when used as an antigen against positive sera.

In November, 1922, this organism was again encountered in the lungs of a guinea pig previously injected with colostral milk from a cow shortly after aborting. Subsequently the organism was isolated from 15 guinea pigs which had been previously injected with material from the uterus of infected cows or with milk. It has been encountered not only in the lungs of guinea pigs, but also in abscesses occurring in the spleen, liver, and testicles. Thus far the author has been unable to isolate the organism from the tissues of normal guinea pigs.

The results of the cultural, biochemical, and pathogenicity study conducted are reported. It has not been determined definitely whether the organism has any specific pathogenic action on guinea pigs and rabbits. On one occasion the organism induced abortion in a pregnant guinea pig, but repeated attempts have failed to duplicate the result. This organism prepared as an antigen is decidedly nonagglutinable when tested against specific sera for *B. abortus*. Occasionally there is observed a peculiar settling out of the organism in the tube containing serum in a 1 to 50 dilution. It differs from *B. abortus* in that long filaments of rods are found in pure cultures as well as the small rods, and in its consistency, odor, and marked increase in pH of broth cultures and milk, pathogenic properties, and agglutinability. It differs from *Bacillus bronchisepticus* in motility, but otherwise answers the description for the *bronchisepticus* group. The studies have made it quite apparent that this organism belongs to the *alkaligines* group (Bang).

Teat lesions in cows reacting to the tuberculin test, H. MARSH (*Jour. Amer. Vet. Med. Assoc., 68 (1925), No. 2, pp. 185–200, figs. 3*).—The author presents data on 60 cases of teat lesions in cows reacting to the tuberculin test. He finds the lesions to differ somewhat in macroscopic appearance from typical lesions of bovine tuberculosis as found in other organs. Microscopic examination made of sections from 16 of the cases showed the characteristic histopathology of tuberculosis. Acid-fast bacilli were demonstrated in smears from 45 of the cases, usually in very small numbers. The morphology of the bacilli showed a type that was shorter and relatively thicker than the usual form. Laboratory animals were inoculated with material from 36 of the cases, with negative results in all but three cases. In these three cases no recognizable tuberculosis developed, but in one guinea pig in each case acid-fast organisms were demonstrated, in minute, white nodules on the liver in one instance, in the lungs in the second, and in the spleen in the third. Cultures were attempted in 6 cases, without success. It is the author's opinion that these teat lesions are primary lesions due to infection through abrasions on the teat; that they are of the same nature as the skin lesions described by several authors; and that they are caused by *Mycobacterium tuberculosis*, modified to some extent by its habitat in the subcutaneous tissue, rather than by another acid-fast organism giving a group reaction with tuberculin.

Recent studies on ictero-hemoglobinuria of cattle, L. R. VAWTER and E. RECORDS (*Jour. Amer. Vet. Med. Assoc., 68 (1926), No. 4, pp. 494–513, figs. 4*).—The authors report upon investigations conducted at the Nevada Experiment Station, in continuation of those previously noted (E. S. R., 46, p. 684). A new anaerobic bacillus was isolated which is described in detail and for which the name *Clostridium hemolyticus bovis* is proposed. Cultural, biochemical, serologic, and pathogenic differences were demonstrated. The exact manner in which natural infection occurs in cattle has not been established,

though the digestive tract is believed to be the sole portal of entry. Koch's postulates relative to the etiology of an infectious disease were fulfilled.

Infectious abortion in sheep.—A preliminary report, H. WELCH and H. MARSH (*Montana Sta. Bul. 181 (1925), pp. 4*).—This is a brief statement on investigations of infectious abortion in sheep in Montana, where the loss of lambs varies from 5 to as high as 75 per cent and the loss of ews from 0 to 20 per cent. It is pointed out that the disease is due to a vibrio which is common in stagnant water, and in order to prevent losses it is necessary, after the beginning of the breeding season, to keep the pregnant ewes entirely away from infected water. An earlier account of work with this disease in Montana, by the authors, has been noted (E. S. R., 51, p. 785).

Hemophilus ovis n. sp. as the cause of a specific disease in sheep, C. A. MITCHELL (*Jour. Amer. Vet. Med. Assoc., 68 (1925), No. 1, pp. 8–18*).—Under the name *H. ovis* the author describes a new organism which is the cause of a specific disease of sheep on stock farms in the Ottawa Valley, Canada. The malady was at first thought to be hemorrhagic septicemia, the post-mortem findings somewhat resembling those found in that condition.

The influence of diet upon immunity to hog cholera, R. JAY (*Jour. Amer. Vet. Med. Assoc., 68 (1925), No. 2, pp. 168–183*).—The author discusses the causes advanced to account for untoward results in vaccination, and presents evidence of the influence of diet in its interference with the immunizing process.

Elements of hippology, F. C. MARSHALL (*Kansas City: Franklin Hudson Pub. Co., 1925, 4. ed., rev., pp. 170, figs. 111*).—Much of this account has to do with diseases of the horse and their treatment.

Ascariasis in horses, S. HADWEN (*Jour. Parasitol., 12 (1925), No. 1, pp. 1–10, pl. 1*).—Experiments are reported upon in which *Ascaris equorum* eggs were administered to three colts. In the two newborn colts a cough developed in 9 and 16 days after ingestion and in the older colt a slight cold after 20 days. Ascaris larvae were recovered from the air tubes. The eosinophiles became more numerous after a second dose of eggs. The results have led the author to advance the theory that immunity to ascarids is stimulated and increased by repeated attacks of these parasites. It is also suggested that in addition to the production of antisubstances to neutralize the cast-off products of the worms, there is another substance secreted by the eosinophiles which is detrimental to the worms themselves.

[Poultry disease investigations at the Michigan Station], H. J. STAFSETH (*Michigan Sta. Rpt. 1924, pp. 186–190*).—A brief report is made of agglutination tests for *Bacterium pullorum* in chicks, with special reference to cloudy reactions.

During the 3 years that the investigations have been conducted, no cloudy reactions were obtained from males. Heavily producing flocks gave the highest percentage of cloudy reactions no matter what the composition of the ration had been, one flock which had never received any milk having shown a great number.

About 20 birds from a flock in which 80 per cent of cloudy reactions had been found were deprived of all feed, with the exception of a little scratch grain, for 2 weeks, and no effect on the reaction was observed. Fifteen birds selected from 120 cloudy reactors were tested at regular intervals for more than a year, being kept on nothing but a grain scratch feed during the testing. In these birds cloudy reactions were encountered quite regularly for 4 months, and some of them showed cloudiness after 4.5 months. In continued observations of these birds, the author found that, while cloudy reactions tended to

recur in the same birds, it was noted that the cloudiness might disappear in some birds and in others it might reappear after being absent for 1 or 2 months.

Flocks of low productive ability showed very few or no cloudy reactors, even when well fed. Comparatively few cloudy reactions were encountered during the time of molting. These observations led the author to consider it possible that cloudy reactions may be due to metabolic changes associated with reproduction. One bird which had given a positive reaction to the agglutination test and which became visibly ill and very emaciated gave negative results in a dilution of 1 to 50. Upon being killed a large encapsulated abscess was found in the abdominal cavity, from which *B. pullorum* was isolated in pure culture, no other lesions being found. In another bird, which showed a marked droopiness and emaciation and gave slight partial reaction in a 1 to 50 dilution, a typically diseased ovary was found, from which *B. pullorum* was isolated in pure culture.

Such instances led the author to emphasize the importance in eradication work of a constant culling of birds which show signs of disease. Of 9,162 blood samples tested during 1923–24, 1,100 were positive, 650 partial, 2,090 cloudy, and 5,322 negative.

During the summer and fall of 1923 the author investigated a rather severe and extensive outbreak of leg weakness or turning disease in a flock. When the chicks in this flock were a few weeks old they were treated by the owner for leg weakness with 6 per cent cod-liver oil (in a wet mash) and lime. After a temporary improvement they again became affected with leg weakness and also with what might properly be called turning disease. Some of the birds were weak in the legs, others showed incoordination of movement of legs and wings, especially when frightened. Left alone, many of the birds showed a continued and perky turning of the head, and when attempting to move they invariably walked or ran in a circle, flapping their wings and appearing to have difficulty in keeping on their feet while in motion. Some of the birds showed conjunctivitis. Rabbits and chickens inoculated with blood and tissue extracts of affected birds remained well for several weeks, and changes in the ration, made in an attempt to stop this ailment, were without visible effect. The only change noted in the tissues of these birds was marked enteritis. A close examination of the mucous membranes revealed a large number of minute tapeworms in some of the birds and numerous large tapeworms and a number of cecum worms in others. No large roundworms were observed in any of the birds. This led the author to conclude that tapeworm infestation was probably the cause of the trouble. The majority of the birds in the flock finally became affected, the flock was disposed of, and the premises cleaned up.

A disease of chicks and adults once mistaken for bacillary white diarrhea and once for fowl typhoid was under investigation, a coccus that produced acid but no gas in maltose, saccharose, lactose, and dextrose and causing no change in mannite having been isolated from the affected birds.

Field observations and laboratory findings in paralysis of the domestic fowl, H. G. May, R. P. Tittsler, and K. Goodner (*Rhode Island Sta. Bul. 202 (1925), pp. 4–18, fig. 1*).—This is a report of investigations commenced the early part of 1921 and conducted in 38 different flocks throughout the State, in which paralysis with or without blindness has been studied. The symptoms of the disease were found to agree essentially with those reported by Kaupp, of the North Carolina Station, in 1921.[1] Paralysis in epidemic form has ap-

[1] Jour. Amer. Assoc. Instr. and Invest. Poultry Husb., 7 (1921), No. 4, pp. 25–31.

peared only in recent years in Rhode Island. In an affected flock the disease shows considerable variation from year to year. All breeds are apparently equally susceptible to the disease. It was found that confinement of birds in small cages sometimes leads to partial recovery in mild cases, due possibly to enforced rest.

Paralysis could not be traced to feed or any particular system of feeding, and the feeding of yeast and cod-liver oil did not bring about recovery even in mild cases. The disease usually appears in flocks on range, but is also known to appear in birds kept in confinement. At autopsy the tissues are nearly always normal. The lack of atrophy of muscles and peripheral nerves indicates that the seat of the disease is in the central nervous system, and this is confirmed by the finding of microscopic, and, in a few cases, macroscopic lesions in the central nervous system. Attempts to isolate pathogenic or toxin-forming bacteria from tissues or droppings were all negative. No essential difference was found in regard to animal parasites in paralytic and nonparalytic birds. Attempts to transmit the disease by contact, feeding infective material, or by inoculations failed to produce any results. Thus the cause of the disease still remains unknown. Control seems possible through proper rotation methods and sanitation.

AGRICULTURAL ENGINEERING

Irrigation and agriculture (*Commonwealth Club Calif. Trans., 20 (1925), No. 9, pp. 341–404, figs. 11*).—This publication contains the transactions of the Commonwealth Club of California and includes special reports on Existing Irrigation Development in California, by C. H. West; Are We Developing Our Irrigated Areas Too Rapidly? by F. Adams; and the report of the section on irrigation, by F. H. Tibbetts.

Net requirements of crops for irrigation water in the Mesilla Valley, New Mexico, D. W. Bloodgood and A. S. Curry (*New Mexico Sta. Bul. 149 (1925), pp. 48, figs. 17*).—Observations made in cooperation with the U. S. D. A. Bureau of Public Roads on the duty of water for alfalfa, wheat, peaches, corn, potatoes, soy beans, grapes, tomatoes, cabbage, Sudan grass, onions, rye, cotton, sorghum, oats, barley, sweet potatoes, and chili are reported.

The best duty for alfalfa was obtained from about 50 in. of water applied in 5-in. irrigations and for wheat from about 15 to 20 in. applied in 4-in. irrigations. The duty for miscellaneous crops varied widely with the crop. The irrigation season for alfalfa was about 6.5 months and for wheat about 8.5 months.

The yields of most of the crops seemed to be more closely correlated with the amount of water applied than with the soil type. The yield of alfalfa per acre-inch decreased with the amount of water applied. The yield of wheat per acre-inch varied from 27 to 201 lbs.

Evaporation in currents of air, J. W. Hinchley and G. W. Himus (*Inst. Chem. Engin. [London] Trans., 2 (1924), pp. 57–64, figs. 11*).—Studies on the fundamental principles involved in the evaporation of moisture in air currents are reported. The results are presented in graphic form, and should have a bearing on work relating to the dehydration of crops and the loss of water from soils.

Public Roads, [January, 1926] (*U. S. Dept. Agr., Public Roads, 6 (1926), No. 11, pp. 233–252+[2], figs. 2*).—This number of this periodical contains the status of Federal-aid highway construction as of December 31, 1925, together with the following articles: Urban Aspects of Highway Finance, by J. Viner; Common-Carrier Truck Fees and Taxes, by H. R. Trumbower; Efficiency in

Concrete Road Construction.—Part III, The Efficiency of Equipment, by J. L. Harrison; and Protection of Concrete against Alkali, by E. C. E. Lord.

Farmers' handbook of explosives (*Wilmington: E. I. du Pont de Nemours & Co., 1925, pp. 100, figs. 105*).—Instructions in the use of explosives for clearing land, planting and cultivating trees, subsoiling, ditching, and other purposes are given.

Materials testing: Theory and practice, I. H. Cowdrey and R. G. Adams (*New York: John Wiley & Sons; London: Chapman & Hall, 1925, pp. V+129, figs. [56]*).—This book, based on materials testing procedure at the Massachusetts Institute of Technology, contains the following sections: Province of the testing engineer, the report, testing machines, tensile tests, graphs, compressive tests, torsional tests, transverse tests, dynamic tests, test specimens and holders, fractures and their significance, hardness determination, cement testing, testing of sand, timber testing, measuring devices, and verification of testing machines.

A preliminary study of the transverse strength of structural bamboo, A. L. Teodoro (*Agr. Engin., 6 (1925), No. 11, pp. 266, 267, figs. 4*).—Studies conducted at the College of Agriculture of the University of the Philippines on the transverse strength of two varieties of structural bamboo which were cured for 30, 60, and 90 days in the sun and in the shade are reported. The varieties used were thorny and thornless bamboo, which represent the most common structural materials for rural houses and bridges in the Philippines.

The thorny bamboo was found to have a greater transverse strength than the thornless bamboo. The canes in each variety tested showed a fairly perfect elasticity curve. The average transverse strengths of thorny and thornless bamboo were about 280 and 210 kg. (616 and 462 lbs.), respectively. The average deflection per 36 kg. of load was from 1 to 2 cm. (0.39 to 0.79 in.) in thorny bamboo and from 1.5 to 3 cm. in thornless bamboo.

Some practical research in concrete drain tile (*Agr. Engin., 6 (1925), No. 12, p. 309, figs. 2*).—The results of an investigation conducted by the U. S. D. A. Bureau of Public Roads, the Minnesota Experiment Station, and the Minnesota State Department of Drainage and Waters on the effect of alkaline waters on some 125 different types of concrete for use in draintile are briefly summarized. The results have been reported in greater detail elsewhere (E. S. R., 54, p. 180).

A study on reinforced concrete dams, E. G. Harris (*Missouri Univ., School Mines and Metall. Bul., Tech. Ser., 8 (1925), No. 3, pp. 56, figs. 18*).—A comparative study is presented of trapezoidal gravity, arched, horizontal-beam, and vertical-beam dams, one of the purposes being to present a method of study and design of the fourth type.

With reference to reinforced concrete dams, the conclusion is drawn that for more certainty in consistent application of the laws of mechanics, and thereby opening a way to a considerable saving of material, the "mid third" principle should be abandoned, and that all dependence for resistance to overturning should be placed in an isolated foundation at the outer toe of the column, buttress, or wall. It is further concluded that with the above modification in practice there remains no sufficient reason for sloping the curtain walls of vertical-beam dams nor the arch walls of arched dams. It has been found that a great saving of material can be accomplished by making the curtain walls vertical. Vertical beam action is considered more logical for arched dams than cantilever action.

Test of new wall indicates stiffness (*Concrete [Chicago], Cement Mill Ed., 27 (1925), No. 6, pp. 37–39, figs. 5*).—The results of a test by Columbia Uni-

versity of a structure consisting of two walls each 7 ft. long and 8 ft. 6 in. high spaced 15 ft. in the clear are reported, the purpose being to determine the strength of a reinforced mortar wall 4.5 in. in thickness. Under a load of 1,153 lbs. per foot, the reinforced mortar wall showed a lateral displacement at mid-height of the wall section of 0.05 in.

Practical uses of rope on the farm, I. P. BLAUSER (*Illinois Sta. Circ. 301 (1925), pp. 56, figs. 178*).—This gives practical information on knots, hitches, and splices.

Research in power and labor problems at Pennsylvania State College, H. B. JOSEPHSON (*Agr. Engin., 6 (1925), No. 11, pp. 273, 274, fig. 1*).—In a contribution from the Pennsylvania Experiment Station an analytical statement is presented of the factors involved in a study in progress on the cost of labor and power in the production of important food crops in certain types of Pennsylvania agriculture.

Rural electrification in England (*Elect. World, 86 (1925), No. 25, p. 1252*).—Data on the use of electricity on farms in England are briefly presented which are based on an average farm of 150 acres.

The cost of electrification is estimated at about $750 for farm equipment, including 3 motors aggregating 10 h. p., 36 electric lights, all necessary wiring, and complete household appliances. The cost of distribution lines is placed at between $2,300 and $2,900 per mile for 6,600 volt overhead 3-conductor lines. The opinion is expressed that farmers will find electricity profitable if it can be secured for 16 cts. per kilowatt hour for lighting, 4 cts. for heating and cooking, 8 cts. for power, and from 2 to 4 cts. for plowing.

Electrification of sugar plantations, G. L. TRIST (*Facts About Sugar, 20 (1925), No. 46, pp. 1094, 1095, 1097*).—Data on power and lighting equipment and its arrangement, care, and efficient operation under working conditions on sugar plantations in the Hawaiian Islands are briefly presented.

Engine corrosion—its causes and avoidance, F. JARDINE (*Jour. Soc. Automotive Engin., 17 (1925), No. 6, pp. 605, 606*).—Data are briefly reported which indicate that corrosion in gasoline engines is generally due to sulfuric acid formed by the combination of sulfur carried in low-grade fuels and oils with water that enters or is generated in the engine. Much of this trouble occurs in winter, and may be traced directly to the action of water that condenses on the inside of the cylinders and crankcase when a cold engine is started. The water destroys the oil film and comes in direct contact with the metal of pistons, cylinders, and other parts, causing them to rust. If the engine is stopped before it is warmed up, condensation and rusting will be rapid.

The only completely successful method of dealing with the condensation and rust problem is to provide a lubricating system that will begin to function as soon as the engine is started. The splash system has been found to meet this requirement best. If pressure feed systems are used, it is recommended that the oil pump be located in the sump and that no oil screen finer than 30 mesh be used over the intake. Oil lines should be as straight and as short as possible and not less than 0.5 in. in diameter. Connecting rods should have a diametrical clearance of 0.0015 in. and a side clearance of from 0.006 to 0.008 in.

Tests have not confirmed that the use of thin or diluted oils results in the rapid wear of pistons and cylinders. A castor oil film has been found to be more resistant to the action of water than a mineral oil film, and it is suggested as an inside coating for engines that are stored during cold weather.

Origin of quenching cracks, H. SCOTT (*U. S. Dept. Com., Bur. Standards Sci. Paper 513 (1925), pp. 399–444, pls. 3, figs. 15*).—Studies conducted on the

dimensional changes which tool steel undergoes on hardening showed that a 1-in. diameter cylinder was very susceptible to cracking when quenched in oil but not when quenched in water. Presumably the stresses produced by the faster quenching are greater than in the former. Examination of the cracked specimens showed that failure was due to tensional stress at the surface. The axial stress at the surface after quenching in water was found to be compressional and high. It is concluded that hardened steel is highly resistant to compressional stress but not to tensional stress.

An experimental determination of the conditions producing cracks in a particular oil hardening steel showed that cracks are produced by permanent stress, which reaches a maximum value at ordinary temperatures. Permanent tensional stress can be produced at the surface by cooling only when the coefficient of expansion is negative and the steel is plastic.

From an analysis of the temperature distribution during quenching, expressions are derived showing the relations between the major variables of quenching and the internal stress. These relations are in agreement with the experimental results, and suggest practical expedients for the control of internal stress. The bearing of these results on the heat treatment of high stress members of farm machinery seems evident.

An economic study of methods of harvesting soybeans for seed, W. F. SIMPSON (*Jour. Amer. Soc. Agron., 17 (1925), No. 9, pp. 557–567*).—Studies conducted at the Virginia Experiment Station on soy-bean harvesting methods and equipment, with special reference to waste of seed in harvesting, cleanliness of the seed saved, damage to the seed, rate of harvesting, cost of harvesting, and the factors affecting successful harvesting, are reported.

The results showed that the greatest percentage of waste incurred by the cut and thresh method occurs during cutting and shocking. This loss should be less when a binder is used for cutting the crop instead of a mower. The loss next in degree of importance was found to occur during the curing period. This loss also may be expected to be lower when a binder is used for cutting and greater when a mower is used. The pea huller was found to be more desirable than the grain thresher for threshing except for small crops. The percentage of waste incurred by the row harvester was about double that incurred by the cut and thresh method. Seed saved by a row harvester must be fanned.

The costs of the several methods of saving soy-bean seed were found to differ but little when considering the value of the various amounts of waste. Consideration of the straw was found to depend upon the way in which the farmer can best make use of it rather than as a factor in favor of either method. The row harvester was found to be more convenient when labor is considered.

While no definite conclusions are drawn, it is considered evident that the row harvester method is the logical one of saving soy-bean seed, and that should a field harvester of a more efficient type than the modern row harvester be developed, the advantages in favor of this method of harvesting soy beans for seed would be outstanding.

Vermin-proof and other fencing, A. P. VAN DER MERWE (*Union So. Africa Dept. Agr. Jour., 11 (1925), No. 4, pp. 338–350, figs. 5*).—In a contribution from the Grootfontein School of Agriculture data on different types of fencing for the exclusion of vermin from agricultural lands are presented.

Comparative tests of automatic ventilators, J. P. CALDERWOOD and A. J. MACK (*Kans. Engin. Expt. Sta. Bul. 14 (1925), pp. 30, figs. 15*).—Comparative

tests of 30 representative types of automatic ventilator are reported, the purpose being to determine their relative effectivness.

The results showed that a slight gain in efficiency is made by those ventilators which utilize the wind to better advantage. The rotary siphoning types were the most effective, followed in order by the plain rotary, the stationary siphoning, and the plain stationary types.

Studies to determine the effect which siphons have upon the operation of the ventilator showed that three of four ventilators gave better results with all siphons open. All four ventilators gave better results with the siphons closed on the windward side and open on the leeward side. These results are taken to indicate that the siphons slightly assist the effectiveness of the ventilator in some cases.

Slightly better results were also obtained when the siphons on two rotary siphoning ventilators were open than when they were blocked. The increased effectiveness of the rotary siphoning ventilator over the plain rotary type, however, lies chiefly in construction. In the main they were so constructed that the path of egress of air had no obstruction or sharp turns. The projected area was also enlarged, resulting in increased suction. These factors were also used to advantage by the most effective plain rotary ventilator.

The decrease in velocity of moving air due to abrupt turns seemed to be an important factor in automatic ventilators. Ventilators having inlet pipes which projected above the bottom of the storm band were uniformly low in effectiveness. This was especially noticeable in the plain stationary group. It was found that any unnecessary extension of the ventilator pipe above the bottom of the storm band reduced its effectiveness.

The introduction of resistance also decreased the effectiveness of ventilators. A slight decrease in efficiency was noted in those ventilators having an inverted cone or other peculiarly constructed top. Similarly, those ventilators which were equipped with shutters decreased in effectiveness in proportion to the obstruction such shutters produced.

The results as a whole are taken to indicate that the most effective action in inducing air through a ventilator is the vacuum produced in the wake of the wind. The most effective ventilators took advantage of this principle. Those ventilators which presented a large obstruction to the wind, other factors being equal, gave the better results.

Basic principles of ventilator design are outlined on the basis of these findings.

Dairy barns for Montana farms, H. E. Murdock, R. M. Merrill, and J. O. Tretsven (*Montana Sta. Circ. 130 (1925), pp. 22, figs. 15*).—Information on the planning and construction of dairy barns to meet Montana conditions is presented together with drawings of structural details and equipment.

Water and plumbing systems for farm homes, E. W. Lehmann and F. P. Hanson (*Illinois Sta. Circ. 303 (1925), pp. 20, figs. 12*).—Practical information on water and plumbing systems for farm homes, with special reference to Illinois conditions, is presented.

RURAL ECONOMICS AND SOCIOLOGY

Research work in agricultural economics [at South Carolina Station] (*South Carolina Sta. Rpt. 1925, pp. 35–44*).—The purpose and method of a number of investigations are set forth, and the preliminary results from certain ones are briefly given.

The farm management study in Anderson County.—Records for 1924–25 taken in the continuous study of cotton farms reported upon for an earlier

year (E. S. R., 52, p. 588) are tentatively summarized here. The average yield of cotton on all the farms studied was 227 lbs. of lint, the average on the 26 best ones 291 lbs. The average cost of man labor on all farms was $16, that on the 26 best ones $14. The labor income on the average farm was minus $502, and on the best farm $943. The expenses per $100 of income in the one case were $84, and in the other $54. It is pointed out that while the large majority of these farmers are not making living expenses, 15 per cent of them are notably successful.

Special farm management studies.—The conditions found on the better-paying farms in the Fountain Inn Community of Greenville County are briefly stated.

Economic survey of Greenville trade territory.—A consumer-demand study has revealed certain information which is presented tentatively here. About 5 per cent of the fresh farm produce for the city of Greenville is supplied at the curb market, 35 per cent is brought in by wagons and trucks, and 60 per cent by rail. A large part of that trucked in originates in North Carolina and comes chiefly in the fall season. The winter and spring supply comes by express and freight, largely from California and Florida, while the summer supply is principally of local origin. The largest single import, both in value and in bulk, consisted of various forms of feed. Although the surrounding area is principally devoted to cotton, 85 per cent of the poultry and 42 per cent of the eggs consumed in the county are produced within a radius of 25 to 30 miles of Greenville.

Silage and silage costs in Mississippi, J. N. LIPSCOMB and C. J. GOODELL (*Mississippi Sta. Bul. 229 (1925), pp. 16, fig. 1*).—A study was made of the conditions which have contributed to the standstill in silo construction in Mississippi in recent years, and a survey was conducted to determine the basic expenditures involved in harvesting silage crops and filling the silo.

It was determined that an average of 5.1 man hours and 2.8 horse hours were required for the harvesting of 1 ton of silage. The hiring of a silage cutter and power was considered more economical than owning, except where tractors were needed for other farm work. The amount of land and labor required to produce 1 ton of corn silage would produce 4.2 bu. of corn, or that required for 1 ton of sorghum silage 3.2 bu. of corn. Estimating the cost of corn silage, a charge of $3.95 is allowed for 4.2 bu. of corn, 51 cts. for man labor, 28 for horse labor, and 50 cts. for machinery charge. The cost of sorghum silage is estimated on the basis of a charge of $3.01 for the equivalent for 3.2 bu. of corn, and the same charges for the other items, these estimates being based on the average costs of 25 farms.

Some hitherto unpublished data collected in 1914 showing the cost of construction of 67 silos in the State are included.

An appraisal of power used on farms in the United States, C. D. KINSMAN (*U. S. Dept. Agr. Bul. 1348 (1925), pp. 76, figs. 55*).—A summary of information that has to do with the use of power in agriculture under present conditions has been prepared from published and unpublished governmental and other sources, including the United States census. The discussion of the assembled data is presented under the heads of sources of power used on farms, the annual use and cost of power on farms in the United States, the number of power units or installations and the number of workers engaged in agriculture, the primary power available and horsepower hours utilized annually, the effect of the use of power and machinery on production and income, the power and labor requirements of farm operations and of farm commodities, the distribution of farms and farm lands and types and sizes

of farms, the seasonal distribution of the use of labor and power, the factors affecting the efficient utilization of power and labor, the choice of power, and its future use.

It is indicated that approximately 16,000,000,000 h. p. hours are used annually on farms in the United States at the present time. Of this amount animal power furnishes about 61 per cent, tractors 16, motor trucks slightly less than 4, stationary engines 12.5, windmills slightly over 1, and electric power 5.5 per cent. Of the power developed about 48 per cent is utilized for field work, 15 for road hauling, 7 for hauling about the farm, 17 for heavy stationary work, and 13 per cent for light stationary work. The most serious factor affecting the efficient utilization of power and labor on farms is the extreme seasonal demand of many of the farm operations. Other factors that have an important effect on the efficiency are the diversity of operations on any given farm; the short periods during which the majority of the individual operations are carried on in a year; the low load factor, that is, the small percentage of time a large part of the power equipment is in use during the year; and the small size of the power unit commonly under the control of one worker. The rate paid for labor particularly is said to have much to do with deciding the most profitable size of power unit.

Present available information would indicate that power equipment is utilized to replace human labor in but little over one-half of the work now done on farms. It is available for a considerable part of the remaining work, but for various reasons is not now utilized. The two appendixes contain 24 tables and a selected bibliography of Federal and State publications, books relating to farm power, and the publications of societies and organizations.

An advertising survey of the farm market (*New York: Blackman Co., 1924, pp. 66, figs. 15*).—This is a mimeographed report, in which are assembled facts of interest from the advertising and selling point of view about agricultural production and the farm population in the United States.

Crops and Markets, [January, 1926] (*U. S. Dept. Agr., Crops and Markets, 5 (1926), Nos. 1, pp. 16; 2, pp. 17–32; 3, pp. 33–48; 4, pp. 49–64; 5, pp. 65–80*).—A general review of the week's markets for important classes of agricultural products is given in each of these numbers, together with tabulations and brief summary articles setting forth the receipts and prices of the current week, with comparisons, and data on foreign crops and markets.

Monthly Supplement to Crops and Markets, [January, 1926] (*U. S. Dept. Agr., Crops and Markets, 3 (1926), Sup. 1, pp. 32, figs. 3*).—The usual tables showing the acreage, yield per acre, production, farm prices, and value of farm crops are presented in this number, together with the statistical report of the livestock and meat situation for November, 1925; the receipts and disposition of livestock at public stockyards for 1924 and 1925; reports on milk markets; shipments of fruits and vegetables; and cold storage holdings. Among the special features of the number are tabulations of the estimated aggregate value of 22 crops, by States, for recent years and periods of years; a report on the December 1, 1925, pig survey for the United States; preliminary totals from the 1925 census showing the production, uses, and grades of potatoes, 1924 and 1925; a study of the utilization of the corn crops of 1923–1925, inclusive; percentages indicating the reduction from full yield per acre of 8 crops from stated causes, 1909–1924; prices to jobbers and total shipments of 14 fruits and vegetables, 1925; and a summary of boll weevil damage to cotton, 1915–1924, by States.

Crop and livestock report, F. P. Willits et al. (*Penn. Dept. Agr. Bul. 409 (1925), pp. 37*).—This report on the production and value of crops and livestock

for Pennsylvania for 1924 has been compiled from returns received from official cooperative crop correspondents.

Cooperation in marketing Washington farm products, E. F. DUMMEIER (*Washington Col. Sta. Bul. 194 (1925), pp. 5–108, figs. 14*).—Following a general discussion of marketing functions and the possibilities of cooperative marketing, some of the accomplishments of cooperative organizations in the State of Washington marketing eggs and poultry products, dairy products, fruits and vegetables, and grain and hay are recounted. A number of federations are also described.

Seasonal fluctuations of wheat prices, R. M. GREEN (*Kansas Sta. Circ. 121 (1925), pp. 11, figs. 4*).—The course of prices of top No. 2 hard winter wheat at Kansas City over a period of 32 years is discussed and illustrated, and the conditions influencing the tendencies in the wheat market are reviewed month by month from July to June, inclusive. Marked periods of strength are found to occur in September and October, January, and April, while the periods of weakness occur in June, July and August, November, and February and March. Noting changes in the seasonal movement of competitive supplies in recent years, it is pointed out that the elimination of Russia and to some extent of Rumania and the substitution of increased acreage in Canada, Argentina, Australia, and the United States have been the main causal factors.

Agriculture in Central America, H. H. BENNETT (*Jour. Amer. Soc. Agron., 17 (1925), No. 6, pp. 318–326*).—The principal types of agriculture in Central America are specialized farming represented by the production of bananas, coffee, and sugar for home production and export; general farming, including the production of food products, chiefly for local consumption; livestock farming; and milpa or patch farming. Particularly favorable soil conditions and rainfall prevail, and since the soil is not subject to erosion the very rolling land can be cultivated. These considerations and the fact of the control of tropical diseases lead the author to predict a substantial and steadily increasing development of the agricultural possibilities of this region.

The land and its people, LORD ERNLE (*London: Hutchinson & Co., [1925], pp. 257*).—The first five chapters of this volume trace the transition in the rural districts of England from collective to individual farming and the changed position of agricultural laborers since medieval times. The two succeeding ones deal with the late war period of State control of agriculture. Chapter 8 discusses some of the popular charges that have been made against agricultural landowners, while the two final chapters, written in 1922, point out certain of the difficulties of framing an agricultural policy and of giving State assistance to agriculture. It is held that the future success of British farming will be largely dependent upon the increased production of bread, meat, and milk.

Agriculture in the Canton of Marle, R. JUSTINART (*Le Marlois Agricole. Thesis, Inst. Agr., Beauvais, 1924, pp. 134, figs. 2*).—This is a description of the agriculture of a section of Picardy, France, presented under the headings of social conditions; the history and organization plan of certain agricultural societies; economic conditions, such as wages, land values, and others; and the principal crops and livestock produced.

Spanish agriculture [trans. title], A. BARTHE (*Rev. Écon. Internatl., 17 (1925), III, No. 2–3, pp. 346–364*).—This is a brief historical and statistical summary of changes in agricultural production in Spain since the close of the eighteenth century.

Soviet agriculture in 1925 (*Russ. Rev., 3 (1925), No. 22, pp. 446–448*).—The yields of grain per acre, the net crop per capita of the rural population, and the sowings of sugar beets are briefly reported for 1925, with comparisons for earlier years.

A physiological and economic study of the diets of workers in rural areas as compared with those of workers resident in urban districts, A. B. Hill (*Jour. Hyg., 24 (1925), No. 2, pp. 189–240, figs. 8*).—Of a number of weekly diet studies collected in Essex County, England, during the months of February to November, 1923, 98 were deemed sufficiently accurate to lend themselves to statistical interpretation. These studies are analyzed in detail here, the results being checked with those of numerous other cost of living studies.

It is indicated that as the income per man per week increases, the calorific value of the diet steadily increases. One-fourth of the families studied had incomes of over 10s. per man per week. A very large percentage of the wage must be devoted to food, and on the average 31.4 per cent of the money spent on food is used to buy bread and flour.

The average weekly income of the families included in this study was £1 17s. 1d., and of this amount the man contributed £1 9s. In 87 cases a little over one-half had some source of income in addition to the father's wage, and the average amount thus secured was somewhat over half the average wage earned by the father. In 21 cases the house was occupied by the family rent free. Nearly 50 per cent of the families lived in houses which they rented at between 2 and 4s. The accommodations obtained were, on the whole, bad.

Boots were a heavy item of expenditure both for the man and the children. The family depended largely upon gifts and extra earnings made at harvest times for purchases of clothing. The average amount paid per family for insurance and to clothing clubs was, for 68 studies which gave sufficient details, 1s. 9d. per week.

The results of this study were found to be quite consistent with those of earlier similar investigations. It is suggested that for the agricultural laborers' families the consumption of breadstuffs has probably gone down in the last three-quarters of a century, the consumption of sugar, including jam and treacle, has gone up enormously, and the consumption of fat very considerably.

The results of this investigation were examined in relation to dietary investigations that were made in Glasgow in the years 1916 to 1919, inclusive, and 1921, 1922, and 1924 and a study of the nutrition of miners and their families in 1923. The general indications are that urban workers, securing varying scales of higher wages than rural workers, are not securing a commensurate superiority of diet, while the diet of the very poor urban classes is considerably lower in value than that of the agricultural laborers. The protein content of the rural diet is not excessive and often falls below that of urban diets, a greater proportion of it being vegetable protein. The fat content lies distinctly below that of urban diets and the carbohydrate content distinctly above, probably as a result partly of the greater consumption of vegetables and partly of a lower income necessitating a greater expenditure on bread and less on meat.

The total income of the agricultural families was substantially below that of any of the groups of miners' families studied. The Essex studies show a superiority to the mining studies with the highest incomes, but an inferiority to those groups with an income more closely approximating their own. The percentage of food money devoted to bread is much higher in the rural districts. The agricultural worker, in proportion to his wages, secures a diet

of higher calorie value than the town worker (1) by a smaller purchase of animal protein and by a relatively greater consumption of carbohydrates to compensate for a smaller consumption of fats, (2) by spending a greater percentage of his income on food, (3) by increasing his hours of work to produce home-grown food, and (4) perhaps by more careful marketing.

Comparison was made of the physique of urban and rural children with the result that little evidence was found of malnutrition among the rural children of Essex. Their physique was better, age for age, than that of urban children living on a diet equivalent or superior in energy value.

The automobile and American agriculture, J. M. McKee (*Ann. Amer. Acad. Polit. and Social Sci., 16 (1924), No. 205, pp. 12–17*).—The passenger automobile has become an important socializing force in rural life, and the truck is becoming more and more used in the farm business.

What the automobile has done to and for the country church, W. H. Wilson (*Ann. Amer. Acad. Polit. and Social Sci., 116 (1924), No. 205, pp. 83–86*).—Rural ministers are learning the function of the automobile in widening their sphere of influence. Its general use by the rural population has given a new basis for the selection of many rural congregations and has tended to sift attendance. It is deemed important in the success of parish organization and the development of supervision of churches.

AGRICULTURAL AND HOME ECONOMICS EDUCATION

An extension program in home management and farm management for the Western States, with reports of standing regional committees on range livestock, dairying, farm crops, and human nutrition, W. A. Lloyd (*U. S. Dept. Agr., Dept. Circ. 375 (1925), pp. 16*).—Excerpts are given here from the reports of the regional standing committees of extension workers in the Western States collaborating with the Department, with reference to programs and methods for range livestock, dairying, farm crops, human nutrition, home management, and farm management extension work. These reports were brought to the 1925 conference and present the plans for about three years' work.

[Report of extension work at the Michigan Station], R. J. Baldwin et al. (*Michigan Sta. Rpt. 1924, pp. 250–327*).—Reports of the work of county and home demonstration agents and the extension work in household management, clothing, teaching correct nutrition habits in the schools as well as with boys' and girls' clubs, farm crops, dairying, animal husbandry, pomology and olericulture, potato culture, soils, insect control, apiculture, household engineering and drainage, marketing, poultry husbandry, and agricultural engineering are made in these pages by the leaders of the several projects. A brief report by the supervisor of extension publications is included. It is pointed out in the general report of the director that while economic production and distribution will remain the keystone to the extension teaching program, increasing emphasis is being placed upon human and social welfare in the home and community.

FOODS—HUMAN NUTRITION

The influence of the method of preparation on the digestibility of corn meal, M. M. Kramer and M. J. Halstead (*Jour. Home Econ., 17 (1925), No. 2, pp. 75–78*).—In the digestion experiments reported, corn meal prepared in five ways—as thin wafers, muffins, mush cooked thoroughly in a pressure cooker, mush boiled 10 minutes, and raw in a frozen pudding—furnished 72 per

cent of the protein and 74 per cent of the carbohydrate in a simple diet consisting of fresh apple 255, dried whole milk 31, cane sugar 28, butter 93, and corn meal 240 gm. daily. Each preparation was used for a 3-day period. Five subjects took part in one or more of the experiments, but only one served throughout all the periods.

The coefficients of digestibility of the carbohydrate of the diet were practically uniform, the minimum, maximum, and average values being 98.7, 99.7, and 99.2. Greater variations in the coefficients of digestibility of the protein were obtained, minimum, maximum, and average values being 70.1, 82.8, and 77.7. The coefficients of digestibility of the protein on the various diets in the one person who served as subject throughout all of the periods were wafer period 76.3, mush cooked in pressure cooker 82.4, muffins 78.4, mush cooked 10 minutes 79.7, and raw corn meal 82.7. It is concluded that the method of preparation of the corn meal had practically no influence on the digestibility of the carbohydrate and but little on that of the protein.

A study of methods of determining the loaf volume of bread, W. O. Whitcomb (*Cereal Chem., 2 (1925), No. 5, pp. 305–310*).—Five methods of measuring the loaf volume of bread by displacement of seeds or liquid were compared by the use of standard loaves representing tall narrow, tall round, and low long loaves made from wood and enameled to make them impervious to water. Flaxseed was used as the displacing material in the first comparison which included the hourglass method of collecting the excess seed in a tube through an hourglass arrangement, the Kansas method of pouring the seed not displaced into a graduated tube, and the Montana method in which the seed used fills the original container and the displaced seed is collected in a graduated flask. The deviations from the standard volume obtained by these methods varied from —125 to +105 cc. In a comparison of the accuracy of various seeds in a single method (Kansas), millet seed gave the most nearly correct results for the tall loaf and flaxseed for the low loaf.

The author concludes that it is not practical to measure loaf volume closer than 10 cc.

Jelly strength of pectin jells, G. L. Baker (*Indus. and Engin. Chem., 18 (1926), No. 1, pp. 89–93, figs. 9*).—An apparatus especially adapted for measuring the strength of pectin jellies is described and illustrated, and some of the factors of jelly strength as determined by the use of this apparatus are discussed.

The principle involved in the apparatus is the displacement of air by water in a bottle and its transference to a syringe chamber and manometer. The energy required to force the syringe plunger into the jelly is recorded on the manometer as a measure of the jelly strength. In testing jellies, two determinations are made, one in the glass and the other on the bottom surface of the jelly when turned from the glass.

In the preparation of the pectin and jellies used in the experimental work, the methods of Tarr and Baker (E. S. R., 51, p. 411) were followed. The effect of acidity was first determined, with results confirming those of the above-noted study in that the optimum points of jelly strengths followed the 1:2:3 ratio for sulfuric, tartaric, and citric acids. The minimum acidity for jelly formation appeared to vary from pH 3.7 for the organic acids to pH 3.55 for sulfuric acid. The optimum points for the three were pH 3.1 for sulfuric, 3.2 for tartaric, and 3.3 for citric acid. Previous observations that tartaric acid produces the strongest and most desirable jelly of the fruit acids were confirmed by the jelly strength measurements.

Tests with varying amounts of sugar showed that at a given pH a definite pectin-sugar ratio must be maintained in order to obtain a jelly of optimum strength. In a jelly containing 1 gm. of pectin a 69.44 per cent concentration of sugar produced the maximum jelly strength, and for 2 gm. of pectin the optimum concentration was 66.66 per cent. Beyond a concentration of pectin representing 0.97 per cent of the weight of the finished jelly, cloudiness and an undesirable texture resulted. Concentration of the pectin in the presence of acids before adding the sugar decreased the strength of the jelly, while boiling after the addition of sugar was without appreciable effect. Decreasing the temperature of the jelly increased its strength.

Fruit jellies, P. B. MYERS and G. L. BAKER (*Delaware Sta. Bul. 141 (1925), pp. 14–19*).—In this progress report a summary is given of the results obtained in the jelly strength measurements noted above and in studies of the viscosity of pectin solutions as influenced by changes in H-ion concentration and of the rôle of salts in fruit jellies.

The work on viscosity was undertaken chiefly to determine the isoelectric point of pectin and its relationship to viscosity. On increasing the acidity of a pectin solution of definite concentration, a slight decrease in viscosity was obtained, but no definite point of minimum viscosity corresponding to the isoelectric point could be found. A slight decrease in viscosity was also obtained by varying the amount of sodium hydroxide added to the pectin. The point of optimum viscosity was judged to be at the initial pH of the pectin, 4.14.

In the study of the effect of salts on the jellying properties of pectin solutions, jellies were made according to the Tarr method (E. S. R., 51, p. 411) except that sodium sulfate and sodium hydrogen tartrate were added in varying amounts. The results thus far obtained are summarized as follows:

The minimum point of jelly formation was in all cases between pH 3.5 and 3.55. The optimum point varied between pH 2.85 and 3.3, depending upon the nature of the acid and salt used. In the presence of salts the range of total acidity within which a good jelly resulted was much wider than in the absence of salts. The presence of buffer materials in natural fruit juices, with resulting wide range in the acidity at which jelly formation takes place, is thought to explain the housekeeper's success in jelly making without means of adjusting fruit juices to a definite acidity. The strength of a jelly made in the presence of a salt was found to be dependent upon the initial pH value of the solution and the concentration of the salt. A quantity of salt sufficient to adjust the pH value to approximately 3.1 tended to make the strongest jelly. Adding an amount of salt sufficient to buffer the acid to a value on the other side of the optimum point corresponding to the initial jelly strength did not change the strength of the resulting jelly.

The place of sugar in the diet, A. E. TAYLOR (*Hygeia [Chicago], 3 (1925), No. 11, pp. 627–629*).—The author bases this discussion on his classification of foodstuffs as maintenance foods and fuel foods (E. S. R., 50, p. 262). Sugar, belonging to the second class, is considered solely with relation to other fuel foods, and its principal uses are outlined as a conserver of foods, a flavoring substance, a satiation factor, a staple fuel, and an emergency fuel. "The place of sugar in the diet of the population is determined by taste, custom, convenience, and price, and it lies for practical purposes and within reasonable limits outside of the domain of discussion of nutrition."

Egg white vs. casein as source of protein in the diet of rats, H. S. MITCHELL (*Amer. Jour. Physiol., 74 (1925), No. 2, pp. 359–362, figs. 2*).—A comparison of casein and egg white at different levels of intake as the sole

source of protein in rations for rats is reported, with the conclusion that while casein has a slight advantage over egg white, particularly for the more rapidly growing males and when lower proportions of proteins are used, egg white is a very satisfactory source of protein for practical purposes when dry yeast supplies vitamin B and is especially adapted for the preparation of rachitic diets or in diets low in minerals. This conclusion is contrary to that of Boas (E. S. R., 51, p. 862) that egg white is an unsatisfactory source of protein. In the present study no loss of hair in the animals on egg white, such as noted by Boas, was observed.

Principles of general physiology, W. M. BAYLISS (*London and New York: Longmans, Green & Co., 1924, 4. ed., [rev.], pp. XXVIII+882, pl. 1, figs. 260*).—The fourth ediiton of this volume (E. S. R., 46, p. 255) was prepared during the last illness of the author by a group of biologists, physiologists, and chemists, each of whom was responsible for bringing up to date the subject matter and bibliography of certain chapters or sections.

Physiological chemistry, A. P. MATHEWS (*New York: William Wood & Co., 1925, 4 ed., pp. XVIII+1233, figs. [103]*).—The most important changes in the revision of this volume (E. S. R., 44, p. 610) cousist in additions in the chapter on carbohydrates to include the recent work of Irvine (E. S. R., 51, p. 607) and the addition of brief chapters on the chemistry of the skin, the eye, and defense against disease.

Is prolonged bed rest a prerequisite for the measurement of basal metabolism? F. G. BENEDICT and E. E. CROFTS (*Amer. Jour. Physiol., 74 (1925), No. 2, pp. 369–380*).—As a result of preliminary observations conducted on the senior author and a somewhat extensive series of observations on a group of college women students, the conclusion is drawn that "the basal metabolism measured after a night's sojourn in bed with the body well covered, warm, and relaxed, is but insignificantly increased in a period following the muscular exercise of rising, bathing, dressing, walking in wintry weather for 10 minutes, and climbing three flights of stairs, provided that after such exercise the subject lies clothed and lightly covered in a room at circa 20° C. [68° F.] for a period of 30 minutes. This finding would seem to justify making basal metabolism experiments after one-half hour's repose, even if the patient leaves home and goes directly to the laboratory or hospital. The customary sojourn in the hospital overnight, prior to such tests, seems therefore to be unnecessary."

A typical series of skin temperature determinations made before rising, after walking in the cold, and after lying in bed for the one-half hour preceding the basal metabolism determination showed a considerable loss of heat and fall in peripheral temperature as the result of the walk. That this should not have affected the heat production is thought to indicate that, at least under the conditions of the experiments reported, heat production and heat loss are two independent processes.

The effects of inanition and malnutrition upon growth and structure, C. M. JACKSON (*Philadelphia: B. Blakiston's Son & Co., 1925, pp. XII+616, figs. 117*).—Inanition is used in this work as denoting the lack of food or any foodstuff (including water) which is essential to the living organism. The various types of inanition are classified as total (quantitative) and partial (qualitative). Complete total inanition denotes the entire absence of food, incomplete total inanition general underfeeding, and complete and incomplete partial inanition the entire absence and insufficient amounts, respectively, of one or more of the necessary foodstuffs, including proteins, fats, carbohydrates, salts, vitamins, and water.

A brief review is first given of the effect of total and partial inanition on plants, protozoa, and higher invertebrates, following which the literature on the effects of inanition upon vertebrates, including man, is dealt with in a systematic manner. The general effects upon the body as a whole are considered first, following which each organ or part of the vertebrate body is considered in relation to the effects of total inanition and various forms of partial inanition upon its morphology. General conclusions, tables of weight changes in the organs of various animal species as the result of inanition, and an extensive bibliography of references included in the text complete the volume.

Feeding, diet, and the general care of children, A. J. BELL (*Philadelphia: F. A. Davis Co., 1924, 2 ed., rev., pp. XV+290, pls. 11*).—A useful handbook for mothers and nurses on the feeding, hygiene and development, and diseases of children.

Variability in weight for height in children of school age, H. K. FABER (*Amer. Jour. Diseases Children, 30 (1925), No. 3, pp. 328–335, fig. 1*).—The author has subjected to statistical analysis the height and weight data for age of 17,674 boys and 16,346 girls from 5 to 14 years of age, all of whom were school children in San Francisco and were measured and weighed by trained nutrition workers using uniform technique. Placing the data in four groups of weight for sex and age and comparing them with the Baldwin-Wood tables, calculations were made for each subgroup of the mode; standard deviation for underweight and for overweight, with corresponding coefficients of variation; and the 10 and 90 percentiles. The results for each group were averaged to give the mean variability for both sexes and each year of age.

Plotting the distribution of cases with pounds of weight as abscissas and number of cases or percentage of total cases as ordinates, a frequency curve was obtained showing a narrow limit for leanness and a wide one for obesity, with the peak or mode corresponding in nearly all cases with the normal weight for height of the Baldwin-Wood tables. Grouped by sexes, the relative variability for underweight after 7 years and for overweight was higher and increased more rapidly with age for the girls than the boys.

The author is of the opinion that these differences are too great to be disregarded, and that in place of a single standard of variation such as is now used standards should be adopted for the different conditions of sex and age. As a tentative scale of standards a table of percentages for underweight and overweight in which age and sex are taken into account is proposed, and such a table of smoothed values for practical use is given below.

Limiting percentages for underweight and overweight, by age and sex

Age	Boys		Girls		Age	Boys		Girls	
	Underweight	Overweight	Underweight	Overweight		Underweight	Overweight	Underweight	Overweight
Years	*Per cent*	*Per cent*	*Per cent*	*Per cent*	*Years*	*Per cent*	*Per cent*	*Per cent*	*Per cent*
5	7	9	7	9	10	8	11	9	14
6	7	9	7	10	11	9	12	10	15
7	7	9	7	11	12	9	12	10	16
8	8	10	8	12	13	9	13	10	17
9	8	10	9	13	14	9	13	10	17

Energy metabolism of premature and undersized infants, M. E. MARSH and J. R. MURLIN (*Amer. Jour. Diseases Children, 30 (1925), No. 3, pp. 310-320*).—In this supplement to a previous paper from the same laboratory on the energy metabolism of normal newborn babies (E. S. R., 53, p. 366), 82 observational periods on 21 premature and undersized infants, including 5 pairs of twins, are reported.

The basal metabolism averaged 6.48 calories per hour or 26.25 per square meter (Lissauer) and 2.04 calories per kilogram per hour. These figures are lower by 2.91 calories per hour on the basis of body surface but slightly higher on the basis of weight than those reported for full-term normal babies. Averaged by age, the metabolism per square meter was lower for each day than that of normal babies of the same age. The average basal respiratory quotient was low (0.74) through the fifth day and then rose to 0.79, but did not reach the average for normal of 0.85.

The increase in metabolism brought about by activity ranged from 2.5 per cent for slight restlessness to 40.3 per cent when the subject cried 39 per cent of the time, thus confirming the observation noted in the previous paper that crying 1 per cent of the time increased the metabolism by about 1 per cent. By averaging all the cases with small feedings and comparing them with the average for large feedings, an increase of 42.1 gm. of food increased the metabolism 5.19 calories per square meter per hour, or 21.3 per cent.

Comparison and interpretation on a caloric basis of the milk mixtures used in infant feeding, G. F. POWERS (*Amer. Jour. Diseases Children, 30 (1925), No. 4, pp. 453-475, figs. 14*).—By calculating the constituents of a large number of milk mixtures commonly used in infant feeding in terms of the percentage of each energy-producing nutrient in the total energy value of the food as fed, the author has demonstrated that these milk mixtures may be classified in seven distinctive groups as follows:

Group 1, the human milk group, containing approximately 8 per cent protein, 41 per cent carbohydrate, and 51 per cent fat. In this group are placed among others the butter-flour mixtures, most of the top milk mixtures, with added sugar, and the synthetic milk adapted of Gerstenberger and Ruh (E. S. R., 42, p. 660). Group 2, the cow's milk group, contains approximately 20 per cent of protein, 30 of carbohydrate, and 50 per cent of fat and includes cow's milk, evaporated milk, Cream-On, full strength Klim, and goat's milk. Group 3, whey, contains 13 per cent of protein, 74 per cent of carbohydrate, and 13 per cent of fat and includes the malt-soup mixtures, several of the proprietary foods such as Horlick's Malted Milk (when used without added milk), and protein milk, with 15 or 20 per cent added sugar. Group 4, skimmed cow's milk, contains about 45 per cent of protein, 55 of carbohydrate, and no fat and includes completely skimmed milk and lactic acid milk. Group 5, protein milk, contains 30 per cent of protein, 15 of carbohydrates, and 55 per cent of fat. Group 6, sweetened condensed milk, contains 10 per cent of protein, 65 of carbohydrate, and 25 of fat and includes in addition to condensed milk, cow's milk mixtures with added sugar. Group 7, the majority group, contains from 10 to 20 per cent of protein and from 15 to 30 per cent of fat and includes many of the ordinary modifications of cow's milk. Each of these groups is discussed in considerable detail.

The nitrogen and mineral balances in infants receiving cow's and goat's milk, A. L. DANIELS and G. STEARNS (*Amer. Jour. Diseases Children, 30 (1925), No. 3, pp. 359-366*).—Following the general plan of previous metabolism studies (E. S. R., 52, p. 764), a comparison was made of the calcium, phosphorus, and nitrogen balances in infants receiving in consecutive 3-day periods

cow's milk and goat's milk feedings. The milk from one goat was used in three cases and from another in two. The two samples of milk varied considerably in composition (protein 3.65 and 2.8 per cent and fat 3.2 and 3.25 per cent and ratio of P_2O_5 to CaO 1.6 and 1.25, respectively), but these differences did not appear to cause consistent differences in the results.

The urinary phosphates in all the goat's milk periods were higher than in the corresponding cow's milk periods. The excretion of nitrogen was also greater on the goat's milk. The calcium and phosphorus balances were higher in some cases and lower in others on the goat's milk. The ratios of P_2O_5 to CaO were quite variable and did not point to any significant difference between the two types of milk. It is concluded that there is no indication from the data obtained of a nutritive superiority of goat's milk over cow's milk.

The identity of vitamin A.—The comparative effects of human and cow's milk, H. Pringle (*Roy. Dublin Soc. Sci. Proc., n. ser., 18 (1925), No. 8, pp. 93–97, figs. 4*).—This paper contains a limited number of composite growth curves of rats on diets in which vitamin A was furnished alternately by cow's milk and human milk. A sharp drop in the curves when 12 cc. of human milk was substituted for the same amount of cow's milk is interpreted as indicating not so much a quantitative as a qualitative difference in the vitamin A of the two types of milk.

"The administration of human milk in each case resulted in a sharp drop in weight without any previous stationary period, which suggests that human milk contains either a growth-retarding factor for the tissues of a more rapidly growing animal than man, or else vitamin A is one of a class of catalysts which accelerates growths according to the requirements of the particular species, or else human milk is deficient in vitamin B. The rapidity of the weight fall does not support this."

Light and the antirachitic factor, C. E. Bloch and F. Faber (*Amer. Jour. Diseases Children, 30 (1925), No. 4, pp. 504–512*).—In this paper, which was read before the Medical Society of Copenhagen January 13, 1925, the authors have compared their clinical experiences at the Danish State Hospital on the therapeutic action of light with work reported from American and English laboratories on the effect of light on experimentally produced diseases in animals.

Beneficial effects are reported in the use of the quartz mercury vapor lamp in the treatment of rickets, tetany, and to a limited extent diabetes. The light treatment of rickets with no change in the diet was followed by a rise in the level of the blood phosphorus to normal values within a month after a total exposure of about 100 minutes. The cure of tetany, with the rise in level of the blood calcium, was even more rapid than that of rickets. Interesting data are given on the fasting blood sugar level before and after rather prolonged light treatment of a 12-year-old girl with severe diabetes. The light baths were given for increasing lengths of time from 10 minutes up to 70, and were followed in five of the seven determinations made by temporary lowering of the blood sugar level equivalent to what would be produced by the injection of from 3 to 4 units of insulin. It is also noted that a rapid rise in the hemoglobin of the blood has followed the carbon arc light treatment of simple anemia in young children.

Sunshine and open air: Their influence on health, with special reference to the Alpine climate, L. Hill (*London: Edward Arnold & Co., 1924, pp. VII+132, pls. 9, figs. 11*).—In this small volume the author has undertaken to explain the scientific principles involved in the curative effects of Alpine climate and in heliotherapy in general. The five chapters comprising the

volume deal, respectively, with high and low atmospheres, humidity and catarrh, sunshine, biological action of light, and metabolism and cooling power. The chapter on the biological action of light contains a concise summary of the biological effects of the various rays comprising sunlight, of interfering and sensitizing factors, and of the effects of ultra-violet rays in the therapy of wounds, tuberculosis, and rickets. Artificial light treatment is discussed briefly in an appendix.

TEXTILES AND CLOTHING

The moisture relations of cotton.—V, The absorption of water by cottons of various origins, A. R. URQUHART and A. M. WILLIAMS (*Brit. Cotton Indus. Research Assoc., Shirley Inst. Mem., 4 (1925), No. 14, pp. 167–174, figs. 4*).—Further studies (E. S. R., 54, p. 93) employing yarns of Sea Island, Sakel, Peruvian, Texas, Indian, and Queensland cotton showed that the differences in hygroscopicity observed among raw cottons are considerably reduced by the partial purification effected by boiling with water. The pure celluloses of these cottons are probably only slightly variable, the differences being largely attributable to the noncellulosic impurities. Knowledge of the hygroscopicity of a cotton seems of slight value for the identification of its type. Examination of several variously processed cottons showed the removal of noncellulosic impurities to be accompanied by a reduction in hygroscopicity, while the dyed material exhibited a further reduction too large to be ascribed to the loading of the cotton with nonhygroscopic substances.

The lustre of raw cottons and of folded yarns spun from them, A. ADDERLEY (*Jour. Textile Inst., 16 (1925), No. 11, pp. T352–T358, pl. 1, figs. 2*).—The luster of various cottons, ranging from Sea Island to Indian, and of folded yarns spun from them was studied, and attempts were made to determine the factors which control the luster of the folded yarn.

With increase of the staple length of cotton, an increase is seen in the proportion of the luster of the raw cotton reproducible in the final yarn. If cottons of the same luster but of varying lengths be spun, the longer cottons produce the more lustrous yarns. This is attributed to the superior spinning qualities of the long cottons, whereby the fibers are arranged more nearly parallel than with the short cottons. The luster of a yarn may depend upon the spinning qualities of the cotton as much as upon the luster of the raw cotton.

The lustre of doubled yarns, A. ADDERLEY and A. E. OXLEY (*Jour. Textile Inst., 14 (1923), No. 11, pp. T361–T374, pls. 12, figs. 2*).—Two methods of showing photographically that the luster of a doubled yarn depends upon its doubling twist are outlined, and a photometer for measuring the relative luster of yarns having different doubling twists is described.

Observations indicated that the luster rises as the doubling twist is put into the yarn, reaches a maximum value, and then decreases with further doubling twist. Measurement of the twist of the singles and of the doubling twist which gives maximum luster showed that, for a range of yarns from 40/2's to 3/2's, the maximum luster is obtained when the doubling twist is in accordance with the rule $t_d = K\sqrt{\text{resultant counts}}$, K being the same constant used in spinning the single yarns. From a consideration of irregularities present in single yarns, combined with irregularities of doubling twist, a certain loss of luster was shown due to irregularities produced during manufacture, thus indicating the need for greater regularity in yarns.

The extensibility of fibers and hairs [trans. title], I. KARGER and E. SCHMID (*Ztschr. Tech. Phys., 6 (1925), No. 4, pp. 124–135, figs. 12*).—Resistance to rupture increased with increasing humidity in cotton and tussah silk but decreased in ramie, wool, camel's hair, and viscose rayon, while the breaking extensibility increased for all these fibers. The form of the extension curve was generally very significantly related to the moisture content of the fiber, whereas the curve of the rate of extension was only slightly affected. The modulus of elasticity of wool was 470 kg./mm.^{2} and of boiled tussah silk 715 kg./mm.^{2}

Artificial silk, J. HUEBNER (*Jour. Soc. Dyers and Colourists, 41 (1925), No. 12, pp. 387–401*).—This review attempts to summarize all available publications, including patents, published on the subject during the past 11 years and abstracted in this journal.

The story of rayon (*New York: Viscose Co., 1925, pp. 61, pl. 1, figs. 23*).—This volume relates the origin of rayon, describes the development of the industry, and discusses the characteristics, uses, and marketing of the fiber. The viscose method of producing rayon is outlined.

Dissecting and calculating silk fabrics, H. NEILD (*New York: Amer. Silk Jour., 1924, pp. 175, figs. 31*).—This practical handbook on the manufacture of broad and narrow fabrics discusses silk and other fibers, the testing of silk, and the dissection of fabrics, and gives formulas and examples for the analysis and construction of yarns and fabrics, with cost calculation forms for skein and piece-dyed silk and mixed yarn fabrics.

A microscopic study of fabric, C. C. HUBBARD and E. M. SCHENKE (*Washington, D. C.: Natl. Assoc. Dyers and Cleaners, 1925, vol. 1, pp. [25], pls. 21*).—This treatise describes and illustrates by photomicrographs the following defects in fabrics: The corrosive action of stains on fabric, the effect of perspiration on pure silk, silk damaged by sodium chloride, mulberry silk damaged by a web-forming insect, tussah (wild silk), brittleness in silk incident to service, sunburned (carbonized) silk drapes, cut fiber ends, silk and rayon burned by a cigarette, and two-shaded effect in dyeing. Photomicrographs also depict artificial silk (rayon), the construction of yarn (thread), neutral soap and liquid soap in water and their effects on wool, and soil removed during dry cleaning.

Fabrics and how to know them, G. G. DENNY (*Philadelphia and London: J. B. Lippincott Co., 1923, pp. 146, figs. 49*).—This practical handbook defines fabrics and terms relating thereto, outlines textile tests and the practical analysis of fabrics, and classifies fabrics by cloth structure and by trade names.

Amounts of soap and builder necessary to soften water of different degrees of hardness, H. B. ROBBINS, H. J. MACMILLAN, and L. W. BOSART (*Indus. and Engin. Chem., 18 (1926), No. 1, pp. 27–29, figs. 4*).—This investigation was undertaken to determine whether it is more economical in laundry practice with hard water to use a pure soap or a soap containing a builder such as sodium carbonate or, if both soap and builder are used, whether it is more economical to use them together or to add the builder first and then finish the softening process with the soap. Tests were conducted both on a laboratory scale and under laundry conditions, in the latter case using a small washing machine for shaking the solution tested. A suds permanent for 1 minute was taken as the end point in the laboratory tests and the formation of a 2-in. suds in 3 minutes in the laundry tests.

The results of these tests indicate that for maximum economy sodium carbonate (soda ash) should first be added with agitation, followed after a

little time by the soap. The use of soap alone or soap and builder together as a softener is uneconomical. The amount of soda ash to add to water of different degrees of hardness to obtain the required softening action is tabulated.

It is pointed out that if cost is the only factor to be considered there would be little doubt of the advantage of using soda ash first, but that if the materials to be washed are put into the water before either soda ash or soap is added, the addition of soda ash alone will tend to discolor the fabric more than if the soap is added at the same time.

MISCELLANEOUS

Annual report of the director for the fiscal year ending June 30, 1925, C. A. McCue et al. (*Delaware Sta. Bul. 141 (1925), pp. 32, fig. 1*).—This contains the organization list, a report of the director including a financial statement for the fiscal year ended June 30, 1925, and departmental reports. The experimental work recorded is for the most part abstracted elsewhere in this issue.

Thirty-seventh Annual Report of the Massachusetts Agricultural Experiment Station, [1924], S. B. Haskell et al. (*Massachusetts Sta. Rpt. 1924, pp. 14*).—This report consists of the organization list, a report of the director, a meteorological summary for the year, and a financial statement for the fiscal year ended June 30, 1924.

Thirty-seventh Annual Report of the [Michigan Station], 1924, E. B. Hill et al. (*Michigan Sta. Rpt. 1924, pp. 156–1030, figs. 365*).—This contains a financial statement for the year ended June 30, 1924; reports of the director and heads of departments on the work of the station during the year, the experimental features of which are for the most part abstracted elsewhere in this issue; and reprints of Special Bulletins 119–135, Technical Bulletins 61–64, and Circulars 61–64, all of which have been previously noted.

Report of the Porto Rico Agricultural Experiment Station, 1924, D. W. May et al. (*Porto Rico Sta. Rpt. 1924, pp. [2]+29, figs. 15*).—This contains the organization list, a report of the director as to the general conditions and lines of work conducted at the station during the year, and reports of the assistant chemist, horticulturist, assistant horticulturist, plant breeder, agriculturist, and plant pathologist. The experimental work is for the most part abstracted elsewhere in this issue.

Thirty-eighth Annual Report of the South Carolina Experiment Station, [1925], H. W. Barre (*South Carolina Sta. Rpt. 1925, pp. 102, figs. 36*).—This contains the organization list, a financial statement for the fiscal year ended June 30, 1925, and a report of the work and publications of the station during the year. The experimental features reported are for the most part abstracted elsewhere in this issue.

Annual Report [of the Vermont Station] (Thirty-second to Thirty-eighth, 1918–19 to 1924–25, inclusive), J. L. Hills (*Vermont Sta. Bul. 249 (1925), pp. 16*).—This report contains the organization list, financial statements for each of the fiscal years ended June 30, 1919 to 1925, inclusive, and a report of the director on the work, publications, and projects of the station during this period.

NOTES

Arkansas University.—According to a note in *Arkansas Agriculturist*, S. Ross Wallis, an assistant county agent in North Carolina, has been appointed extension poultry specialist.

California University and Station.—Construction will soon be begun on the new building for agricultural engineering and irrigation investigations, for which $125,000 is available. The building will provide offices for the staffs of the two divisions, laboratories, an auditorium seating 125 persons, and a machinery hall with a floor space of approximately 14,000 sq. ft. The laboratories will include a research laboratory for soil moisture investigations, a large laboratory for undergraduate instruction, and a special laboratory for investigations of the economics of pumping. The machinery hall will house the exhibits of representative modern machinery and also models of early farm machines obtained through arrangements recently made with the U. S. Patent Office, the Smithsonian Institution, and the U. S. Department of Agriculture. The building will constitute the first unit of a group which will eventually house all activities of the two divisions.

Connecticut State Station.—The station has recently been presented with two portraits, one of its founder, Prof. Samuel W. Johnson, the gift of Mrs. Thomas B. Osborne. The other is a portrait of Dr. E. H. Jenkins, director emeritus, painted by Ellen Emmett Rand.

Harold R. Murray has been appointed graduate assistant in plant breeding.

Delaware Station.—*Science* notes that L. E. Blackman, assistant chemist, has been appointed head of the chemistry department of Upper Iowa University.

Kansas College and Station.—Eric Englund, professor of agricultural economics and land economist, has been granted a year's leave of absence, a part of which will be devoted to graduate work for the Ph. D. degree at Harvard University. He has also accepted an appointment as agricultural economist in the Office of Experiment Stations and has entered upon his duties, which are expected to center around the administrative problems in rural economics and sociology presented under the Purnell Act. Mrs. Englund, head of the department of household economics, has resigned, effective June 1.

Dr. P. M. Gilmer, associate professor of biology and entomologist in the New Mexico College and Station, has been appointed in charge of an entomological laboratory to be established in southern Kansas by the U. S. Department of Agriculture and the station for a study of the codling moth. Reginald Painter has been appointed to succeed Dr. W. P. Hayes in entomological work, beginning September 1.

Louisiana University and Stations.—A. F. Kidder, instructor in plant breeding in the university and agronomist in the station, has resigned, effective June 15, to accept a position as cotton breeder for the growers of Cañete Valley, Peru. He will be assisted in this work by H. V. Geib, assistant professor of agronomy in the university.

C. G. Fox, a 1925 graduate of the University of Missouri, has been appointed assistant professor of poultry husbandry.

Minnesota University.—A review of graduate work in agriculture in the university during the 19-year period beginning with 1906–07 has recently been prepared by the committee on graduate study in agriculture. This review shows not only the remarkable progress which is being made in advanced study in agriculture but also the significant contributions which the State

is making to leadership in agricultural education through training men for responsible positions.

In 1912–13, the earliest date showing agricultural enrollment separately, there were 12 graduate students in agriculture; in 1924–25 there were 228. The percentage enrollment in agriculture at these periods was 6.55 and 16.2 per cent, respectively, of the total graduate enrollment in the university.

In the 19 years the university has conferred 1,176 master's degrees and 197 doctor's degrees. Of the master's degrees, 243 were in agriculture, and 61 of the doctor's degrees were in that subject.

Of 252 persons given advanced degrees in agriculture during this period, 197 are either teaching in colleges or universities or are employed by agricultural experiment stations, the U. S. Department of Agriculture, or foreign government agricultural research institutions. Of this group, 120 are connected with experiment stations and agricultural colleges in this country, 16 being heads of departments; 26 are employed by the U. S. Department of Agriculture; 8 are in foreign agricultural colleges; and 11 are in foreign agricultural research stations.

Michigan Station.—R. Wayne Newton, assistant agricultural economist in the Office of Agricultural Taxation, Bureau of Agricultural Economics, U. S. D. A., has been appointed research associate in economics and will study farm taxation. Other appointments include Arthur Russel Marston on May 1 as assistant in farm crops at the corn borer research substation at Monroe, Wilson Martin on May 1 as research assistant in forestry vice Fay Hyland and stationed at the forestry substation at Dunbar, and E. P. Johnson, D. V. M., as assistant in bacteriology, effective July 1, for work with bacillary white diarrhea.

Missouri University.—Plans are being made for an innovation in the 1927 Farmers' Week whereby all in attendance will assemble daily from 10.45 a. m. until noon for addresses by nationally-known speakers upon a variety of farm problems. It is believed that the completion of hard-surfaced roads crossing the State from north to south and from east to west and intersecting at Columbia will assure a record-breaking attendance.

Warren Gifford, instructor and junior dairy husbandman in the West Virginia University and Station, has been appointed instructor in dairy husbandry.

New Mexico Station.—John Carter, jr., a recent graduate of the Kansas College, has been appointed in charge of a Purnell fund dry-farming project in northeastern New Mexico. Three experiment fields, each of approximately 10 acres, have been rented, one being near Clayton, one near Capulin, and the other near Mosquero. The first season the work will consist principally of variety tests of alfalfa, the sorghums, corn, wheat, barley, millet, beans, cowpeas, field peas, Russian sunflowers, sweet clover, and broomcorn. Weather records are, in addition, to be kept at each of the fields. Near Mosquero a rotation experiment is to be inaugurated.

Field work was also recently begun on a cooperative project at Estancia. On a 20-acre field the rainfall is being supplemented by irrigation water from a pumping plant, the crops grown being those of comparatively small water requirement.

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EXPERIMENT STATION RECORD

VOL. 54 JUNE, 1926 No. 8

From time to time criticism is heard of agricultural research institutions and their personnel for an alleged failure to keep pace with workers in other lines of scientific endeavor. Sometimes it is charged that the investigation of agricultural problems has become too standardized and professionalized, lacking in contact with farm needs and in that perspective and vision which would lead to the most effective correlation of endeavor and a concentrated and comprehensive attack upon farm problems. Occasionally this condition is ascribed to "inbreeding" among research workers, and a need of "new blood" is asserted if a threatened "going to seed" is to be averted.

So far as these criticisms apply to the experiment stations, they deal with matters of vital concern. Research in agriculture is a veritable corner stone of progress in a fundamental industry. It is being supported by both National and State Governments on a more liberal scale than ever before because of a belief that it is, on the whole, a productive and profitable investment. The situation is not unlike that of prospecting, with many "blind leads" and unremunerative veins well-nigh inevitable, but to be conducted with full realization of the necessity for intelligent and well-directed effort, and as a justification for the enterprise a reasonable expectancy of ultimate success.

The responsibility thus rests upon all who are engaged in promoting research with public funds to see that it is conducted in the most advantageous and effective way. This responsibility is positive and constructive, and demands far more than the avoidance of ill doing. "Getting into a rut" and "threshing over old straw," for instance, may not be indictable offences under present-day standards in some lines of work, but in a search for the unknown they are peculiarly serious conditions and if widely prevalent they could undoubtedly sometimes be nearly as detrimental to progress as a deliberate misapplication of funds.

Conditions of this type are insidious and sometimes difficult of detection, but fortunately there is little reason to suspect their existence in the stations on any considerable scale. On the contrary, abundant evidence is available to demonstrate that these institutions

both individually and as a class have never been freer from a dissipation of their energies in perfunctory and inconsequential matters than they are to-day. Never have they been working with so little lost motion, so little duplication of effort. Never has their work been better organized or more adequately adjusted for their most effective service as research agencies.

The charge of "being in a rut" possibly arises through a misconception on the part of some of those critically inclined as to research methods and policies. The clearing up of many of the simpler problems with which the stations were largely occupied in their early days has brought about an increased concentration upon more fundamental and more intricate questions. For many of these, investigations extending over several seasons may be required before conclusions can be safely drawn. Persistence upon such inquiries year after year may give the appearance of marking time, of following closely upon the same old course without regard to changed conditions that present new needs, of failing to be progressive and responsive to demands for information, new either in kind or in type. Assuming, however, that the project has been wisely chosen and is of an importance commensurate with the time and efforts which are being expended, the stations are entitled to commendation for prosecuting the inquiry to its logical conclusion. Eventually such a policy can hardly fail to be more productive than one of vacillation, and even the appearance of inflexibilty should be materially lessened with the opportunities to cope with new situations of importance now becoming available by the use of the steadily enlarging funds under the Purnell Act.

The habit of drifting along with a project without apparent goal or with only slight prospects of ultimately useful results is less readily justified. Such an occurrence is much less common than formerly, but it is still encountered in some of the stations, though quite seldom when an effective checking up of the status of projects is systematically practiced by the director's office. Within the past year, commendable progress has been achieved in numerous instances in the revision of projects by the elimination of "deadwood" and minor enterprises, and with the steadily growing realization of the desirability of such a scrutiny it is safe to say that at no time has there been so little of this type of work in the stations as at present. This is especially true of projects supported from the Federal funds.

That the great majority of investigations are being advanced to a productive stage is indicated by the noticeable increase in the quantity and even more markedly in the quality from the research point of view of the station publications. In the early days a considerable proportion of the station output comprised compilations and popu-

lar articles, but these have increasingly given place to research and technical series, although this has been accompanied by unusual efforts to bring before the public the station findings in effective popular form. There has also been a steady development from negligible proportions to a position of considerable prominence in the contributions of the stations' staffs to technical journals. While difficult of quantitative estimation, first-hand testimony as to the magnitude of these changes can be obtained by an examination of the columns of *Experiment Station Record*, where for some time they have been one of the main causes of an increasing congestion of space limits which have not been extended since 1911.

The fact is that the amount of research in advanced ranges has been greatly enlarged. The type of problem and its approach have undergone changes so striking as to be apparent to even the casual observer. Animal nutrition studies, for example, are no longer restricted to simple feeding trials of lots of pigs or steers, but comprehensive investigations of intricate problems dealing with the vitamins or the influence of minerals, with colonies of rats or guinea pigs and elaborate apparatus, have become quite common. While no less practical, the newer studies are far more substantial and penetrating. To be sure, here and there may still be found a tendency to follow the beaten path, using the old methods and with the old views and aims, but instead of being the rule such cases are growing so exceptional as to attract attention.

Being in a rut demonstrates a failure to do new things. The last decade has seen within the stations an evolution from a program of variety and fertilizer tests to genetic investigations, thoroughgoing and comprehensive studies of soil and crop problems, and fundamental investigations of plant and animal diseases. It has seen the development of work in agricultural economics, rural sociology, engineering features in relation to the economic use of labor and the improvement of home facilities, and to problems of home management, nutrition, and the improved environment of the rural home. These are all evidences of a progressive and forward-looking attitude and of a very tangible and definite advance.

Data recently compiled by the Office of Experiment Stations indicate that within the past fiscal year no fewer than 604 new projects were approved for operations under the Purnell Act, while 29 new projects were instituted as Adams fund projects. This is an average of over 13 new projects per station, which is surely as many as could reasonably be expected to be undertaken with the increase in funds per State of $20,000. Nearly one-half of the Purnell projects were in the relatively new fields of agricultural economics, home economics, agricultural engineering, and rural sociology, the respec-

tive totals in these groups being 176, 84, 14, and 18. There are also included, however, no fewer than 75 new projects in animal production, 35 in entomology, 33 in horticulture, 29 in plant diseases, and a smaller number embracing nearly every field of agricultural science.

In character the new projects are as varied as the conditions prevailing in the 48 States from which they come. Some are fundamental and comprehensive and will require years for their completion. Others are relatively simple and designed to meet what is more or less an emergency situation. As a whole, they present very little indication of the tendency to "go over the farmer's head," which is sometimes asserted, and it is improbable that such a trend is at all common. From the beginning the stations have been in close touch with the farm and its problems, and their difficulty has traditionally been to resist a pressure for immediate results which has not always been conducive to the most thorough and conclusive work. With their present intimate relationships with extension forces, farm organizations, and other agencies dealing with the farmer at first hand, there is probably even now less danger of overlooking a vital need than of undertaking to do too much and to do it too speedily.

The charge of inbreeding in the stations is of lesser importance if a high standard of productiveness is being maintained, but it is doubtful if this accusation can be sustained to any appreciable extent. Despite the competition for men from extension, teaching, and commercial fields, standards for experiment station workers have been materially raised and are still rising. More advanced training is required for entrance into the work, and facilities are being developed in many institutions for its subsequent acquisition, quite largely through leaves of absence for study elsewhere. Moreover, new ideas and methods have been brought into the stations by an interchange of scientific workers—the migration of an economist from New York to Florida, an agricultural engineer from Iowa to Alabama, a plant pathologist from South Carolina to Wisconsin, or a chemist from Hawaii to Arizona or Rhode Island to the Southwest. Within the past five years, 13 changes have been made among the station directors alone. During the same period there has been an increase of approximately 25 per cent in the scientific personnel, the total rising from 2,172 to 2,722, an increase of 550 new workers in addition to the obviously considerable number of replacements. During the past year there have been added in the relatively new fields 84 investigators in agricultural economics, 38 in home economics, 18 in agricultural engineering, and 7 in rural sociology. With such changes already going on and with every prospect of

others as the work expands, the influx of new blood must be considered both appreciable and significant.

Nor has the interchange between institutions been limited to personnel. The transferring of projects from one station to another is no longer unusual, and there are other indications of an enlarged freedom of intercourse. The possibilities of cooperation are still far from full realization, but a great advance has already been made. The increased freedom with which investigations are discussed between workers, the comparison of notes, the presentation of results at the leading scientific meetings for criticism and comment, all these are evidences of a change of attitude, of a broadening of the community of interest, and of participation far removed from the traditional drawing within one's shell, the seclusion in the laboratory, the withdrawal from contact with those interested, and the treatment of work as if it were a purely personal affair. It is this new spirit of whole-hearted cooperation in labors for the common good that gives much promise for the future.

During the early years of the postwar period, the stations as a group were severely handicapped by a shrinkage in their net incomes, due to the failure of many States to readjust their resources to the increased cost of living. Such a condition, if long continued, might easily have led to discouragement and eventually to stagnation and retrogression, but perhaps because the spirit of research itself is essentially forward-looking and progressive the immediate consequences were less detrimental in this respect than might have been expected. The passage of the Purnell Act and the disposition in many of the States to give greater support to agricultural experimentation has brought a new and a better day. Individual stations are still laboring under difficulties and many conditions are susceptible of improvement, but the outlook as a whole was never more favorable or the stations in a better position to rise to their full opportunity for service.

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

Applied biochemistry, W. MORSE (*Philadelphia and London: W. B. Saunders Co., 1925, pls. 3, figs. [260]*).—"Medicine aims to prevent or cure faulty action of the body, and biochemistry is concerned with those actions which are interpretable in chemical terms." This sentence from the introductory section of this treatise on biochemistry might serve as a keynote of the text, which aims to present the biochemical facts and principles which are definitely related to medicine as a whole. An attempt is made to arouse in the student interest in biochemistry as a modern science by an introductory history of its development in this country and by photographs of living biochemists, with accompanying statements of their particular contributions in the sections in which they have had special influence.

The usual method of intermingling text with laboratory tests is followed, with separate chapters at the end on methods for the determination of blood constituents and metabolic studies on blood and urine. Instead of the more customary terms proteins, fats, and carbohydrates, "protids," "lipids," and "glucids" are used to conform to the nomenclature adopted by the International Union of Pure and Applied Chemistry. Vitamins are discussed from the standpoint of normal nutrition in the chapter on Nutrition from the Chemical Standpoint, and in the light of their practical interest in medicine in the chapter on Metabolic Adjuvants, which deals with avitaminoses and endocrinoses. An abundant use of structural formulas, graphic summaries, footnotes to original literature, and lists of suggested readings adds to the usefulness of the volume.

An appendix contains directions for the preparation of the reagents required in the laboratory exercises given, a scheme for the analysis of milk, a table of vitamin distribution, including vitamins D and E, and various other useful tables.

Chemistry in the service of man, A. FINDLAY (*London and New York: Longmans, Green & Co., 1925, 3. ed., rev. and enl., pp. XIX+300, pls. 4, figs. 26*).—In the revision of this volume (E. S. R., 39, p. 8) new chapters have been added on radioactivity and atomic structure, the rare gases of the atmosphere, and metals and their alloys.

Practical physical chemistry, A. FINDLAY (*New York and London: Longmans, Green & Co., 1923, 4. ed., rev. and enl., pp. XVI+298, figs. 117*).—In the revision of this combined text and laboratory manual of physical chemistry, various sections have been added, including sections in the chapter on electromotive force dealing with oxidation and reduction potentials and with the methods of electrometric analysis and a chapter on colloids dealing chiefly with suspensoids.

Physical chemistry for students of medicine, A. FINDLAY (*London and New York: Longmans, Green & Co., 1924, pp. IX+227, figs. 39*).—The subject matter of this volume is based on the course of medical physical chemistry at the

University of Aberdeen, Scotland, and includes the phases of physical chemistry which have important applications in the medical sciences. Throughout the text the principles presented are illustrated by biological reactions and phenomena. Frequent reference is made to the author's *Practical Physical Chemistry* noted above.

Manual and reference book on physicochemical measurements, W. OSTWALD and R. LUTHER, edited by C. DRUCKER (*Hand- und Hilfsbuch zur Ausführung Physikochemischer Messungen. Leipzig: Akademische Verlagsgesellschaft, 1925, 4. ed., rev., pp. XX+814, pls. 3, figs.* [523]).—A fourth edition of this exhaustive manual and reference book on physicochemical measurements.

Bibliography of bibliographies on chemistry and chemical technology, 1900–1924, compiled by C. J. WEST and D. D. BEROLZHEIMER (*Bul. Natl. Research Council, 9 (1925), No. 50, pp. 308*).—Part 1 of this compilation includes a few general bibliographies not conveniently classified under special headings, part 2 a list of general abstract journals and yearbooks dealing with chemistry, part 3 a partial list of the collective indexes of serials, part 4 bibliographies on special subjects arranged alphabetically, and part 5 a brief list of personal bibliographies.

Organic syntheses, edited by C. S. MARVEL ET AL. (*New York: John Wiley & Sons; London: Chapman & Hall, 1925, vol. 5, pp. VII+110, figs. 3*).—This volume, which continues the series previously noted (E. S. R., 54, p. 7), contains directions for the preparation of 33 organic compounds, including *l*-cystine by the hydrolysis of keratin from hair and *d*-glutamic acid by the hydrolysis of gluten from wheat flour.

Recent contributions to the chemistry of the cotton plant and its products, C. A. BROWNE (*Jour. Oil and Fat Indus., 2 (1925), No. 3, pp. 87–96*).—This is a review and correlation of the work of various laboratories of the Bureau of Chemistry, U. S. D. A., on the chemistry of cottonseed oil, cottonseed meal, and the odorous constituents of the cotton plant.

Constituents of crude cottonseed oil, G. S. JAMIESON and W. F. BAUGHMAN (*Jour. Oil and Fat Indus., 2 (1925), No. 3, pp. 101–105*).—Continuing the investigation previously noted (E. S. R., 53, p. 9), an examination was made of the so-called vegetable mucilage in crude cottonseed oil.

The settlings from a 5-gal. sample of crude oil were repeatedly extracted with acetone. The insoluble material was extracted with absolute alcohol and the insoluble residue from this extraction dissolved in water and precipitated with normal lead acetate. On decomposing the lead salt with hydrogen sulfide, removing the lead sulfide, concentrating the filtrate, and adding alcohol, a white gelatinous precipitate of the mucilage was obtained. On adding a small quantity of the mucilage to refined cottonseed oil and stirring the mixture with water, an emulsion was readily formed which showed no signs of breaking after two days. It is believed that the mucilage, which, however, constitutes only a small part of the nonglycerides present in the oil, is a factor in the retention of neutral oil in the soap stock obtained in refining the crude oil. A mucilage with similar properties was separated from ground cotton seed.

A study was also made of the substances responsible for the color of crude cottonseed oil. It was concluded that part of the deep red color of the crude oil is due to a resin which is only partially removed from the oil by treating it with water and extracting the separated oil with alcohol.

Cellulose ester varnishes, F. SPROXTON (*London: Ernest Benn, 1925, pp. XI+13–178, figs. 8*).—This volume and the one noted below belong to the series of oil and color chemistry monographs edited by R. S. Morrell. The first six

chapters deal more particularly with the chemistry of cellulose, cellulose acetate, and cellulose nitrate, and the last three, comprising about half of the book, with the technical phases of the manufacture and the uses of cellulose ester varnishes. Literature references are given at the end of each chapter.

The chemistry of drying oils, R. S. MORRELL and H. R. WOOD (*London: Ernest Benn, 1925, pp. XI+13-224, figs. 24*).—The first half of this monograph is devoted to the chemistry of the drying oils, including the chemical properties of the oils themselves and their component acids, the composition and physical constants of the more important representatives, and the chemical changes involved in the oxidation of drying oils. This is followed by a discussion of the technical phases of the expression and extraction of linseed oil and China wood oil, the refining and bleaching of linseed oil, the manufacture of boiled, blown, and stand oils, and the use of drying oils in the manufacture of linoleum and floorcloth, electric insulators, and patent leather. The last two chapters deal with the properties of drying oils from a colloidal standpoint and the analysis of drying oils. Extensive lists of references to the literature noted in the text are given at the end of each chapter.

The fat and soap industry, O. STEINER (*Industrie der Fette und Seifen. Dresden: Theodor Steinkopff, 1925, pp. [7]+83*).—In this handbook, which is one of a series of progress reports on various chemical industries edited by B. Rassow, recent literature, chiefly German patent literature on fat and soap technology, is reviewed and discussed.

Borneol in spruce turpentine, A. S. WHEELER and C. R. HARRIS (*Jour. Amer. Chem. Soc., 47 (1925), No. 11, pp. 2836-2838*).—Spruce turpentine from the paper mills at Erie, Pa., was found to contain borneol to the extent of about 2 per cent of the turpentine after the removal of *p*-cymene. About 36 per cent of the borneol proved to be *l*-borneol as calculated from its angle of rotation, $[\alpha]^{20}_{D}$—13.64°. It is noted that borneol obtained from a similar source in northern Europe contained from 14 to 22 per cent of *l*-borneol.

The technology of wood distillation, M. KLAR, trans. by A. RULE (*London: Chapman & Hall, 1925, pp. XV+496, figs. 49*).—This is chiefly a translation of the second German edition, appearing in 1910, of this reference book on wood distillation. To bring the subject matter up to date a few additions have been made throughout the text, together with a final chapter on recent progress.

The Brown-Duvel moisture tester and how to operate it, D. A. COLEMAN and E. G. BOERNER (*U. S. Dept. Agr. Bul. 1375 (1926), pp. 44, figs. 26*).—This is essentially a revision and enlargement of Bureau of Plant Industry Circular 72 (E. S. R., 24, p. 215) with the incorporation of the subject matter of Bulletin 56 (E. S. R., 30, p. 506). The additions include detailed directions for standardizing the moisture tester; a discussion with experimental data of various sources of error in conducting the determinations, with suggestions for overcoming them; a description of types of electric heater which may be used for the test, with directions for wiring and conducting the test with this form of heater; and directions for determining the proper extinguishing temperatures to adopt in the application of the Brown-Duvel method for moisture determination to various commodities other than grains.

***Studies on soil reaction.*—III, The determination of the hydrogen ion concentration of soil suspensions by means of the hydrogen electrode,** E. M. CROWTHER (*Jour. Agr. Sci. [England], 15 (1925), No. 2, pp. 201-221, figs. 6*).—In this paper, which continues the series of studies on soil reaction begun by E. A. Fisher,[1] a hydrogen electrode apparatus for soils is described and illustrated by a diagram drawn to scale, and attention is drawn to a

[1] Jour. Agr. Sci. [England], 11 (1921), No. 1, pp. 45-65.

number of factors influencing the results obtained in H-ion concentration determinations on soils, to the effect of salts, and to the measurement of buffer action.

The apparatus is of the Clark rocking type, modified by using a large hydrogen electrode vessel to enable the use of a large bulk of unfractionated soil suspensions. To prevent possible entrance of potassium chloride from the connecting solutions, a large inverted siphon tube is fixed in the middle of the vessel in such a position that the mouth of the tube is at the point of the most rapid movement of the suspension. The conclusions drawn from the study of typical results obtained with the apparatus are summarized as follows:

"Similar or adjacent soils may show considerable differences in pH value, with no changes in their degrees of buffer action, as shown in titration curves with lime water. In such cases the conventional 'lime requirements' are correlated with the pH values, but no such relation holds in dissimilar soils. The pH value of a soil suspension is intimately connected with the nature and amount of the cations present. Neutral salts markedly increase the hydrogen ion concentration of both acid and slightly alkaline soils. Sodium salts, including the hydroxide, give lower hydrogen ion concentrations than the corresponding potassium or calcium salts, and chlorides give lower pH values than sulfates. The degree of buffer action (slope of titration curve) is unaffected by the addition of a neutral salt. Previous extraction of a soil with water causes a considerable increase in the pH value of its suspensions. A number of soils showed a regular increase of about 0.1 in pH value for twofold dilution. The 'salt effect' and 'dilution' effect appear to be of the same type. It is recommended that the soil-water ratio of 1:5 be generally adopted. The indicator methyl red gives erroneous pH values in turbid soil suspensions owing to the absorption of the red form, which is apparently a cation capable of undergoing 'base exchange' with the soil."

The determination of nitrogen in heavy clay soils, D. V. BAL (*Jour. Agr. Sci. [England], 15 (1925), No. 4, pp. 454–459, fig. 1*).—Data are given showing that in determining the nitrogen content of the heavy black cotton soil of the Central Provinces, India, by the Kjeldahl process higher results were obtained when the soil sample was diluted with water before the usual digestion with concentrated sulfuric acid in the presence of copper and potassium sulfates than when the digestion was conducted on the dry soil. This difference was shown to be due to the presence in the soil of an iron-containing cementing material which is insoluble in concentrated sulfuric acid and thus protects the organic matter in the interior of the soil particles from the action of the acid. It is suggested that this possibility of error in the estimation of nitrogen when using air-dry soils should be considered.

An investigation of the chemical changes taking place in the mixed lime sulphur-lead arsenate spray, W. GOODWIN and H. MARTIN (*Jour. Agr. Sci. [England], 15 (1925), No. 3, pp. 307–326, fig. 1*).—An investigation of the chemical changes taking place on mixing lime sulfur and lead arsenate in the proportions used in sprays and of the chemical decomposition of the spray fluid after spraying and the influence of each constituent on the other is reported with the following general results:

The reaction between the two ingredients of the spray was found to be slight. The reactions of the polysulfide sulfur of the lime sulfur were not affected by the lead arsenate, thus showing no effect on the fungicidal value. The arsenic was rendered soluble to only a slight extent, showing no material reduction in the insecticidal value.

In the attempt to trace the changes occurring in the mixed spray fluid after its application to the leaf surface, the conditions were simulated by bubbling

air and carbon dioxide, respectively, through the spray solution and comparing the composition of the spray before and after. With lime sulfur alone it was shown that the oxidation proceeds according to the empirical formula

$$CaS.S_x+3O=CaS_2O_3+S_{x-1},$$

and that the calcium sulfides are hydrolyzed in aqueous solution. The addition of lead arsenate had no effect on the amount of sulfur precipitated from the lime sulfur by oxidation or by the action of carbon dioxide. Lead arsenate was only slightly decomposed by the lime sulfur or its oxidation products. The main decomposition appeared to be due to the action of hydrogen sulfide formed by the hydrolysis of the calcium sulfides, particularly in the presence of carbon dioxide.

It is concluded that the fungicidal value of the mixed spray is not less than that of lime sulfur alone, and may be greater on account of the presence in the spray of soluble arsenates and thioarsenates. The insecticidal value of the lead arsenate is thought not to be greatly affected by the addition of lime sulfur. It is suggested that the increased amount of soluble arsenic formed by the action of carbon dioxide on the mixed spray may prove sufficient to cause spray injury.

The chemical effect of the addition of a "spreader" to the mixed lime sulphur-lead arsenate spray, W. Goodwin and H. Martin (*Jour. Agr. Sci.* [*England*], *15* (*1925*), *No. 4, pp. 476–490*).—Supplementing the above investigation, the authors have studied the effect upon the chemical changes noted as resulting from the combination of lime sulfur with lead arsenate of the addition of spreading materials, including casein, lime casein, and gelatin. Two methods of decomposing the mixed spray under conditions comparable to those occurring on the leaf surface after spraying were used. In one case air was drawn through the spray liquid as in the above study, and in the other the spray liquid was evaporated to dryness spontaneously in contact with the air. In general the amounts of spreaders used conform to those in general practice. Conclusions drawn from the analysis of the sprays before and after treatment are summarized as follows:

The addition of casein alone caused an increase in the amount of soluble arsenic formed on decomposition of the spray but no change in the reactions of the polysulfide sulfur. The addition of lime decreased the formation of soluble arsenical compounds and reduced the fungicidal value of the spray through its reaction with the sulfur liberated from the calcium sulfide. The effect of lime casein depended upon the proportions of lime and casein. If much free lime was present the fungicidal value of the spray was reduced as with lime alone, and there was a tendency to decrease the amount of soluble arsenic. If only a small amount of lime was present the amount of soluble arsenic was increased and there was little effect on the polysulfide sulfur. The addition of gelatin increased the formation of soluble arsenic and had no effect on the reaction of the calcium sulfide. In all cases the rate of decomposition of the spray was retarded by the spreader.

Certification of coal-tar food colors (*U. S. Dept. Agr., Misc. Circ. 52* (*1925*), *pp. 12*).—This circular outlines the procedure for the certification of the permitted coal-tar food colors, the certification of the subsequent batches of the same colors, and the recertification of repacked colors and color mixtures. A list of the permitted dyes, including 4 in addition to the original list of 7 (E. S. R., 26, p. 609), a definition of terms, and miscellaneous directions are included.

Determination of the total solids of bread, R. Hertwig and L. H. Bailey (*Jour. Assoc. Off. Agr. Chem.*, *8* (*1925*), *No. 5, pp. 585–591*).—An umpire vacuum

method and a rapid routine method for determining the total solids of bread are described, in both of which the calculation of total solids is based upon the formula $\frac{B \times C}{A}$, in which A = the weight of loaf at time of receipt, B = weight of air-dried sliced loaf, and C = percentage of total solids in the prepared ground sample. Data are reported showing that if sliced bread is spread out on a paper in a warm room until it is crisp and brittle it does not lose weight appreciably when ground to pass a 20-mesh sieve, and that consequently the total solids of the entire bread loaf can be determined by estimating only the loss in weight during the preliminary air drying of the sliced loaf and the total solids of the ground air-dried slices.

The effect of homogenization, condensation, and variations in the fat content of a milk upon the keeping quality of its milk powder, G. E. Holm, G. R. Greenbank, and E. F. Deysher (*Jour. Dairy Sci., 8 (1925), No. 6, pp. 515–522, figs. 3*).—Samples of whole, condensed, homogenized, and homogenized condensed milk of varying fat content were reduced to powdered form by the spray method with maintenance of approximately the same moisture content, and were then sealed in small tin cans, stored at room temperature, and opened from time to time and examined for tallowiness. In the first series of experiments the time of the first appearance of tallowiness as detected by odor was determined by several investigators. In the second, the so-called induction period was determined by the method of Greenbank and Holm (E. S. R., 54, p. 111).

The results of both series of experiments appeared to indicate that increased fat content resulted in decreased keeping quality. Precondensation and homogenization both improved the keeping quality of the dried milk.

Composition of imported bottled waters, A. E. Mix and J. W. Sale (*Jour. Amer. Med. Assoc., 85 (1925), No. 25, pp. 1963–1967*).—A list is given of all of the imported mineral waters which have been analyzed by the Bureau of Chemistry, U. S. D. A., since the beginning of the enforcement of the Federal Food and Drugs Act in 1907. The waters are grouped in five classes as follows: Class 1, dolomitic limestone type, with calcium and magnesium bicarbonates as predominating constituents; class 2, the Vichy type, predominating in sodium bicarbonate, with more or less sodium chloride; class 3, the sodium chloride type; class 4, the Glauber's and Epsom salts type; and class 5, waters containing substantial amounts of iron salts. Each class is further divided into from two to five subgroups according to the amount of total dissolved mineral matter expressed in milligrams per liter and grains per U. S. gallon.

Deterioration of commercially packed chlorinated lime, C. C. McDonnell and L. Hart (*U. S. Dept. Agr. Bul. 1389 (1926), pp. 20, figs. 5*).—Samples of chlorinated lime packed under customary commercial conditions in containers of various types and sizes were stored in a warehouse and tested at definite intervals for deterioration as determined by the content of available and total chloride chlorine. Other samples of the same lots were packed in glass bottles closed with paraffined cork stoppers, stored in the dark and in the light, and tested at monthly intervals.

The data obtained showed that the keeping qualities of bleaching powder are not greatly affected by the type and size of the commercial container, although the material in the tightly stoppered glass bottles deteriorated slightly less than that stored in cans and in the larger containers less than in the smaller containers. In most of the samples there was a fairly regular loss of available chlorine during storage, most of this being changed into chloride chlorine. There was no marked difference in the rate of deterioration of the summer-

and winter-packed samples. In all cases the deterioration was greatest during the summer months whatever the time of packing. The average loss in available chlorine for all of the samples tested was 1.08 per cent per month for the period covered, 12 to 15 months, the average for the hottest months (May 15 to September 15) 1.44 per cent, and for the coldest months (November 15 to March 15) 0.61 per cent per month.

METEOROLOGY

The weather of 1925 in the United States, A. J. HENRY (*U. S. Mo. Weather Rev., 53 (1925), No. 12, pp. 539, 540, pls. 2*).—Temperature and precipitation departures for different districts of the United States during 1925 are given. The geographic distribution of temperature and rainfall is charted.

"As a whole, the year must be classed as a warm one, thus completing a series of five consecutive warm years beginning with 1921. February, March, and April, 1925, were warm, from 3 to 5° above the average; no abnormally cool weather occurred until October, that month being unusually cool in the Missouri and upper Mississippi Valleys and in parts of the Plains States. October was also characterized by the occurrence of rather early and heavy snow in the northern Rocky Mountain region. December was warm until the close of the month, when a cold spell reached the Gulf region.

"Precipitation was deficient in the great majority of districts; it was most pronounced in the north Pacific States, the Atlantic States south of Virginia, also in the Gulf region. There was more than the normal precipitation in the region stretching from southern Utah and southern Nevada northeastward to the Canadian border."

Meteorological observations at the Massachusetts Agricultural Experiment Station, J. E. OSTRANDER and J. BOWER, JR. (*Massachusetts Sta. Met. Buls. 445–446 (1926), pp. 4 each*).—Summaries are given of observations at Amherst, Mass., on pressure, temperature, humidity, precipitation, wind, sunshine, cloudiness, and casual phenomena during January and February, 1926. The data are briefly dicussed in general notes on the weather of each month.

Meteorological report for 1924, F. E. HEPNER (*Wyoming Sta. Rpt. 1925, pp. 95–97*).—Observations at the University of Wyoming, Laramie, on pressure, temperature, precipitation, wind, and cloudiness are summarized as in previous years. The mean pressure for the year was 23.047 in. The maximum temperature was 85° F. July 15, the minimum −27° December 24. The mean monthly temperature was 40.6°. The last killing frost in spring occurred June 20, the first killing frost in autumn September 11. The annual precipitation was 9.63 in., about 10 per cent below normal.

Monthly Weather Review [November–December, 1925] (*U. S. Mo. Weather Rev., 53 (1925), Nos. 11, pp. 471–517, pls. 13, figs. 17; 12, pp. 519–562, pls. 15, figs. 3*).—In addition to detailed summaries of meteorological and climatological data and weather conditions for November and December, 1925, and bibliographical information, notes, abstracts, and reviews, these numbers contain the following contributions:

No. 11.—The North-Polar Cover of Cold Air (illus.), by H. U. Sverdrup; Meteorological Conditions in the Eurasian Sector of the Arctic (illus.), by B. M. Varney; The Effects of a Lightning Stroke (illus.), by N. E. Dorsey; Ocean Temperatures and Seasonal Rainfall in Southern California (illus.), by G. F. McEwen (see p. 714); A Study of Seasonal Forecasting for California Based on an Analysis of Past Rainy Seasons, by L. E. Blochman (see p. 714); and the Rain-bearing Winds at Atlanta, Ga. (illus.), by C. F. von Herrmann.

No. 12.—Fluctuations in the Values of the Solar Constant, by C. Dorno (see below); Solar Variations (illus.), by H. H. Clayton (see below); Monthly Pressure Variations in the Northern Hemisphere and Seasonal Weather Forecasting, by A. J. Henry (see below); On the Reliability of Hair Hygrometers (illus.), by L. T. Samuels; The East Wind and Its Lifting Effects at Fort Smith, Arkansas, by T. G. Shipman; The Weather of 1925 in the United States (illus.), by A. J. Henry (see p. 712); and Tropical Cyclones during 1925 (illus.), by W. P. Day.

Fluctuations in the values of the solar constant, C. Dorno (*U. S. Mo. Weather Rev., 53 (1925), No. 12, pp. 519–521*).—This article deals with factors affecting the accuracy of measurement of the solar constant, especially the effect of great volcanic eruptions. It also calls attention to the potential value and need of improving the pyrheliometer for use in such measurements.

The author states that "from the constitution of the sun we may draw the conclusion that the radiation which it emits is subject to enormous fluctuation at every moment [and] at every single point of the sun's atmosphere," but questions whether it can be shown beyond doubt that "the ever-present considerable and lively variation of the emission of rays extends to the spectral regions that are allowed to pass through the earth's atmosphere. . . . This *permeability of the earth's atmosphere is in all probability very largely in*fluenced by variations in intensity of the incident radiation, and in the sense that it decreases when the emitted solar radiation increases in intensity, because *a greater incident radiation brings about greater condensations and* chemical transformations in the earth's atmosphere."

With reference to Clayton's weather forecasts (E. S. R., 53, p. 812) based on Abbot's solar constant measurements, the author expresses the opinion that they show, "with greater certainty the more they are fulfilled, that Doctor Abbot does not measure the absolute fluctuations of the solar constant, but with them their effect upon the terrestrial atmosphere also, and particularly their effect in producing changes of its permeability."

Solar variations, H. H. Clayton (*U. S. Mo. Weather Rev., 53 (1925), No. 12, pp. 522–528, figs. 2*).—Summarizing his discussion of the subject, the author draws the following conclusions: "(1) The comparison of simultaneous observations *taken at Mount Wilson and Calama and later at Montezuma and* Harqua Hala shows that the derived values of solar radiation varied repeatedly between the values 1.910 and 1.960, and that the extreme range must have been considerably greater. *A part of this change was due to a long period secular* change, but the larger part was due to short period changes, especially during the interval July, 1918, to September, 1920. (2) The probable error of the individual observations at Mount Wilson is about ±0.009 gram calorie, and at Montezuma less than ±0.006 gram calorie. For groups of values such as I used in my investigations the mean errors were equal to $\frac{e}{\sqrt{n}}$, in which e represents the probable error of the individual observation and n is the number of observations in the groups."

Briefly discussing this paper, C. F. Marvin reiterates his conclusion that Abbot's measurements of the solar constant do not furnish a reliable basis for weather forecasting, holding that "all of the now very small total fluctuations may well be due to instrumental and atmospheric influences."

The paper is also briefly discussed by H. H. Kimball and E. W. Woolard.

Monthly pressure variations in the Northern Hemisphere and seasonal weather forecasting, A. J. Henry (*U. S. Mo. Weather Rev., 53 (1925), No. 12,*

pp. 528–534).—A study of the frequency, geographic extent, and distribution in latitude and longitude of the pressure anomalies in the Northern Hemisphere for the eight years 1910–1917 is reported. Many of the calculated anomalies were featureless. About 10 per cent were pronounced both as to amplitude and extent of area involved. These are discussed in some detail, with special reference to seasonal weather forecasting. The method of seasonal forecasting used by the Indian Meteorological Department (E. S. R., 54, p. 208) is held to be not generally applicable, and tentative suggestions are made looking to the development of a method of seasonal forecasting for the United States. The most important single variable developed by this study "is without question the variations in north Pacific pressures one quarter in advance and the influence of such variations upon the weather of North American Continent. . . . Atlantic pressure is important, but must take a subordinate place to that of the Pacific. The hope of the future so far as seasonal forecasting for the United States is concerned lies in the Pacific."

A study of seasonal forecasting for California based on an analysis of past rainy seasons, L. E. BLOCHMAN (*U. S. Mo. Weather Rev., 53 (1925), No. 11, pp. 489–494*).—An abstract of this paper has been previously noted (E. S. R., 51, p. 717.)

From a study of the last 40 seasons on the southern California coast, the author concludes that when low pressure areas enter directly this region in September or October "there is a ten-to-one probability that the ensuing season (for central and southern California) will be an average to wet one. . . . The rainfall for the same seasons in northern, central, and southern California are sometimes proportionately alike, while in other seasons they are radically different. Of the seasons in which there are no early movements of lows or no summer rains at San Diego, some are still average to wet ones, but all the dry or partly dry seasons follow such rainless summers."

A. J. Henry calls attention to the significant fact brought out by this study that "the coefficients for corresponding pairs of months in some of the 30-year periods differ very materially from each other, whereas in the longer periods the coefficients are fairly uniform as between the several parts of the record."

Ocean temperatures and seasonal rainfall in southern California, G. F. McEWEN (*U. S. Mo. Weather Rev., 53 (1925), No. 11, pp. 483–489, 493, 494, figs. 9*).—This is a more detailed account of studies of which an abstract has previously been noted (E. S. R., 52, p. 207), tending to confirm the hypothesis that there is an inverse relation between late summer temperatures of the Pacific Ocean near shore and the rainfall of the following season, the hypothesis furnishing a more reliable basis for forecasts of deficient rainfall than for rainfall above the average.

Discussing this paper, A. J. Henry questions whether high pressure in the north Pacific endures long enough to be a significant factor in the weather of the Pacific coast six months later.

The climate of New York State, R. A. MORDOFF (*New York Cornell Sta. Bul. 444 (1925), pp. 3–38, figs. 39*).—After a brief discussion of general climatic controls, the local aspects of the climate of New York are shown in detail in tables, charts, and descriptive notes.

It is stated that the State has a diversity of climate not usually encountered within an equally restricted area. The climate of the plateau divisions of the State is almost typically continental. The climate of the Great Lakes region is tempered to a marked extent by the lakes, that of the Long Island region by the adjacent ocean. This is shown especially in milder and more uniform winter temperatures and longer seasons of growth.

There is wide variation in rainfall. For the State as a whole, the winter season, December to February, is relatively dry, the precipitation over the greater part of the State during this season being less than 9 in. The driest part of the State during the winter is the Champlain Valley section, which has an average of less than 5 in. during this period. "It is also dry in winter over most of the central lakes division. Over the southeastern counties, including Long Island, and over the greater part of the Mohawk Valley division, the winter rainfall is liberal, ranging in amount from 11 to more than 12 in." There is good distribution of rainfall throughout the growing season. The average annual snowfall for the State as a whole is about 65 in., but varies greatly in different parts of the State. Serious and long-continued droughts are of rare occurrence.

The prevailing winds are westerly, generally shifting toward the north in winter and toward the south in summer. For the State as a whole, sunshine and cloudiness are about evenly divided. The lowest sunshine, about 40 per cent of the possible, occurs in the south-central counties. In the Atlantic Coast area, the average sunshine is about 60 per cent of the possible.

A study of temperature and precipitation at Albany, N. Y., since 1820 failed to give evidence of any great change in the climate during 105 years.

SOILS—FERTILIZERS

[Soil studies at the Missouri Station], M. F. Miller et al. (*Missouri Sta. Bul. 236 (1926), pp. 23, 77–84, figs. 4*).—The progress results of studies, some of which have been previously noted (E. S. R., 53, p. 414), are reported.

Studies by W. A. Albrecht on the longevity of *Bacillus radicicola* in soil showed that soils which were stored in the dry condition contained no viable legume bacteria for soy beans or red clover 6.5 years after crop growth. Soils left out-of-doors contained viable bacteria for both red clover and soy beans, so that a period of absence of the host plant equivalent to 7 years does not necessarily mean death to these legume organisms when the soil is left in its natural condition as found in the field. The results are taken to indicate that a soil once inoculated will retain the organisms to reinoculate the legume when it comes around in most of the regular crop rotations.

An investigation of the properties of colloidal material in Missouri soils, by R. Bradfield, W. DeYoung, and E. B. Powell showed that the efficiency of neutral salts as coagulants is practically independent of the concentration of the clay, while the minimum amount of alkaline reagents required to bring about complete flocculation is almost directly proportional to the concentration of the clay. Studies on the duration of the effect of chemical treatments indicated that if liberal applications of rather insoluble salts, such as calcium sulfate or calcium carbonate, were used the clay would remain flocculated for several years under ordinary conditions of leaching.

Studies of the effect of different chemical treatments upon the (1) rate of settling of colloidal clay, (2) relative volume of equal weights of sediment, (3) viscosity, (4) rate of percolation of water through clay soils, and (5) miscroscopic structure of the floccules produced indicated that such different treatments tended to produce floccules very different in nature, and that the resultant physical properties of the system as a whole might vary widely with the different treatments. These results showed the necessity of considering the effect of the flocculant upon the nature of the coagulum in addition to its efficiency in bringing about flocculation.

Further studies of the acidity of clay soils by means of conductometric titration curves indicated that the method may be of great value for estimating

the total acidity or adsorptive capacity for bases. The end point obtained was much sharper than that obtained with the hydrogen electrode, and the method was quicker and more convenient.

Studies of the effect of specific surface upon some water relations of soils indicated a direct relationship between specific surface and moisture equivalent. Particles larger than 5 μ in diameter were not appreciably affected by drying or even by ignition. Air drying of particles from 0.025 to 1 μ, however, resulted in the formation of aggregates which had practically the same moisture equivalent value. Strong evidence was obtained that the particles under 1 μ were not primary units but aggregates of primary particles.

Studies of the effect of specific surface of soil separates upon the rate of evaporation of water under controlled conditions of temperature, vapor pressure, and air velocity indicated that the rate was not appreciably affected until the water content was reduced in most cases to less than 50 per cent of the moisture equivalent.

Chemical analyses showed that clay made up of particles of from 1 to 2 μ in diameter was very similar in composition to colloidal clay made up of particles of 0.01 to 0.05 μ in diameter. In the preparation of the finer separates in the study on specific surface it was found that the fraction 1 to 2 μ in diameter continued to yield colloidal clay even after 50 washings. An ultimate mechanical analysis of Putnam silt loam indicated that practically all of the ordinary clay fraction could be reduced to colloidal dimensions by repeated washings. The smallest clay particle observed had a radius of about 0.006 μ.

In studies by F. L. Duley on the effect of various soil treatments upon the amount of calcium that can be dissolved from a soil by means of 0.04 N carbonated water, applications of lime were found to increase greatly the amount of soluble calcium. Data from untreated soils from different parts of Missouri and from experimental fields from five other States where the field results from liming were known showed that soils well supplied with soluble calcium will usually produce good clover and other legume yields even though the soil shows considerable acidity by the usual tests. This was also usually found on soils of rather high potential fertility. On some other soils where the lime content was low, very good results were obtained from liming.

A continuation of studies by Miller and Duley on the rate of accumulation and cost of nitrogen and carbon in soils under different systems of green manuring and cropping showed that the systems used have allowed some decrease in the total content of nitrogen in the surface foot of soil. The largest loss was in the case of rye plowed under each year and the least loss in the case of sod. Even eight consecutive crops of rye followed by cowpeas the same season, both turned under, failed to maintain the nitrogen content of the surface foot. The same was true of clover left on the land and turned under. Even manuring at a moderate rate in a rotation of corn, wheat, and clover resulted in a distinct loss. Under Missouri conditions it appeared that the nitrogen level of the surface foot can not readily be maintained above a content of 4,000 lbs. per acre.

Studies by Miller and Duley showed that the amount of soil lost from land planted to soy beans in rows may be very great. The very important question is raised as to whether soy beans as commonly grown can be considered a valuable soil-building crop on the rolling lands of Missouri.

A continuation of studies by Albrecht on nitrate production in a soil as affected by the crop and cultivation showed that nitrate production was increased by spring tillage and decreased by crop growth. Soil under straw mulch failed to show a significant nitrate accumulation. In the preparation

wheat, early plowed plats showed more nitrate in the fall than ed plats. This seemed to be due to differences in weed growth.
zation by Bradfield and Powell of the effect of chemical treathe rate *of percolation of water through heavy clay subsoils* indiis rate was appreciably increased by applications of calcium sulactually decreased by certain applications of calcium carbonate. studies of percolation movements through natural soil cylinders neter showed that when the natural cylinder was allowed to ry before applying the treatments, the rate of percolation was ised. More consistent results were obtained when small cylinders ith carefully graded, dry granulated samples of the same clay. ts when applied at the rate of 10 tons of calcium carbonate r 2,000,000 lbs. of soil increased the percolation. The order of was calcium acid phosphate, a mixture of equal parts of calcium alcium oxide, a mixture of equal parts of calcium sulfate and onate, calcium sulfate, alumiuum sulfate, and calcium oxide. ge increase ranged from 580 for acid phosphate to 137 for calcium

lies of typical Missouri soils showed that the silica content was est in the surface and least in the subsoil. The iron and alumina ys bore a reciprocal relationship to that of silica. The high conoxides was always directly correlated with the content of colloidal ze distribution curves of the different horizons showed great in- amount of finer particles in the concentration horizon.
tion of studies by Albrecht on the effects of different soil treatcontinued, upon bacterial activity in two continuous wheat soils ne low bacterial activity in these soils as they occur in the field. eks of incubation there was no significant increase in ammonia or the soils were untreated. The addition of lime caused a signise in nitrate in a soil receiving manure and one receiving acid a long period. This is taken to indicate that lime deficiency or aused the low nitrate content in these soils. Both soils showed crease in nitrate content when treated with organic matter, or ganic matter and lime. Under the latter treatment the soil eceived no phosphate showed a much greater increase in when treated with organic matter only. The nitrate producoil which had received acid phosphate and organic matter treatactically the same as that where both organic matter and lime The total amount of nitrates produced with organic matter alone that produced on the soil receiving no phosphate and which was both lime and organic matter. These results are taken to indi sibility that acid phosphate is having an influence similar to so far as nitrate production is concerned.
e relative values of different forms of phosphorus on the soils on the effect of different amounts and different methods of mercial fertilizer on the corn crop, on the best systems of soil for the most important soil types of Missouri, and on crop rortilizer practices are also reported by Miller and Duley.

salt solutions on soil [trans. title], O. NOLTE and E. SANDER . *Sta., 102 (1924), No. 3–4, pp. 219–225, figs. 3*).—In a second conie subject (E. S. R., 47, p. 19), further studies are reported which rked parallelism of the H-ion concentrations of the salt solutions permeability.

The influence of earthworms on the physical and biological properties of soil [trans. title], E. BLANCK and F. GIESECKE (*Ztschr. Pflanzenernähr. u. Düngung, 3 (1924), No. 5, Wirtschaft.-Prakt., pp. 198–210*).—Studies are reported which showed that the nitrifying power of three different soil types was increased by the life activities of earthworms, but that their putrefactive powers were decreased. It was also found that the total soil surface was increased by earthworms.

The action of protozoa on bacteria when inoculated into sterile soil, D. W. CUTLER (*Ann. Appl. Biol., 10 (1923), No. 1, pp. 137–141, fig. 1*).—Studies conducted at the Rothamsted Experimental Station are reported which showed that in normal field soil the bacteria and active amebas have an inverse relationship, and that in such soils the presence of active protozoa is one of the factors concerned in keeping the numbers of bacteria below the level they might otherwise have attained.

Some preliminary investigations on the relationship of protozoa to soil fertility with special reference to nitrogen fixation, S. M. NASIR (*Ann. Appl. Biol., 10 (1923), No. 1, pp. 122–133, fig. 1*).—Studies conducted at the Rothamsted Experimental Station are reported which showed that the presence of protozoa had no depressing effect on the nitrogen-fixing bacteria either in artificial culture media or in sand cultures. From a total of 36 experiments done in duplicate or triplicate, 31 showed a decided gain, while only 5 gave negative results. The highest fixation of 36.04 per cent occurred in sand cultures in the case of ciliates. All three types of protozoa gave higher fixation figures.

Further experiments not only confirmed these results, but indicated that the presence of protozoa is an important factor in the fixation of atmospheric nitrogen by Azotobacter.

A critical enquiry into the alleged fixation of nitrogen by green algae, B. M. BRISTOL and H. J. PAGE (*Ann. Appl. Biol., 10 (1923), No. 3–4, pp. 378–408, pls. 2, figs. 3*).—Studies conducted at the Rothamsted Experimental Station are reported which failed to substantiate the claim that green algae are capable of assimilating free nitrogen from the atmosphere in the presence of nitrate and glucose (E. S. R., 46, p. 723).

Fixation of gaseous nitrogen by higher plants other than legumes [trans. title], G. TRUFFAUT and N. BEZSSONOFF (*Sci. Sol [Truffaut], 4 (1925), No. 1, pp. 56, pls. 2, figs. 16*).—Studies are reported which showed that maize grown in a medium containing no nitrogen or carbon developed and matured normally when the medium was inoculated with nitrogen-fixing bacteria. The root secretions of maize supplied sufficient energy material for the nitrogen-fixing organisms. Under these conditions the ratio of nitrogen fixed to energy material utilized was greater than similar coefficients obtained in laboratory cultures and in soils artificially enriched with sugar or cellulose.

Clostridium pastorianum was found to be an important organism in the bacterial fixation of nitrogen in arable soil.

Nitrogen fixation in the Punjab, P. E. LANDER and B. ALI (*India Dept. Agr. Mem., Bact. Ser., 2 (1925), No. 1, pp. 28, fig. 1*).—Continuing previous work on the subject (E. S. R., 48, p. 320), field and laboratory experiments are reported which showed that normal soils possess the power of rapidly fixing large quantities of nitrogen without the addition of any carbohydrate, but that under certain unknown conditions a rapid loss of nitrogen can also take place. Light soils were found to possess greater nitrogen-fixing power than heavy soils, and more denitrification occurred in heavy than in light soils. Nitrogen fixation was found to occur more frequently than denitrification. It was further found that the soil becomes most suitable for nitrogen fixation after it has been ex-

posed to the climatic conditions for several months after the removal of wheat.

Soil inoculation with Azotobacter, P. E. BROWN and W. J. HART (*Jour. Amer. Soc. Agron., 17 (1925), No. 8, pp. 456–473*).—Studies conducted at the Iowa Experiment Station are reported which showed that small quantities of nitrogen increased the nitrogen-fixing power of *A. chroococcum*, *A. vinelandii*, and *A. beijerinckii* in solution cultures. Sodium nitrate and ammonium sulfate were more stimulating than the organic forms of nitrogen, such as dried blood and cottonseed meal. The nitrate produced in fallow soils was greater under the inoculation treatments, and the methods of preparing the inoculum had little effect on the results. The ammonia content of the soils increased in the early part of the experiment but decreased at the end. The total number of Azotobacter increased and decreased in a manner parallel with the nitrates, but generally indirectly with the ammonia production.

The total nitrogen in the fallow soils was greater at the end of the experiment. *A. chroococcum* and *A. vinelandii* increased the nitrogen content, but *A. beijerinckii* did not. The nitrogen-fixing power of the soil was increased by *A. chroococcum* but not by the other organisms. Soil cultures were slightly more efficient in increasing the nitrogen-fixing power of inoculated soils than were liquid cultures. Although inoculation with the three organisms increased the total nitrogen supply of Carrington loam soil when cropped to wheat, the yield of wheat was not increased.

It is thought that soil inoculation with Azotobacter may become a profitable practice under actual field conditions.

Studies on soil reaction, IV–VI (*Jour. Agr. Sci. [England], 15 (1925), No. 2, pp. 222–255, figs. 8*).—Three further contributions from the Rothamsted Experimental Station are presented in this series (see page 708).

IV. *The soil reaction of continuously manured plots at Rothamsted and Woburn*, E. M. Crowther (pp. 222–231).—These studies showed that the Rothamsted park grass and Woburn barley soils are almost all acid. Ammonium sulfate has caused a considerable increase in acidity and sodium nitrate a slight decrease. Mineral manures have had but little effect, and potassium sulfate has slightly increased the acidity of the subsoil of the more acid plots. There is some evidence that the pH value 3.8 represents a maximum acidity in the Rothamsted soil. The change in pH value as a result of liming is less than that shown in the laboratory, owing in part to the subsoil acidity.

V. *The depth-distribution of reaction and flocculation in continuously manured soils*, E. M. Crowther (pp. 232–236).—These studies showed that the reactions of the unmanured and the limed and unlimed portions of the ammonium sulfate plats on Rothamsted park grass and Woburn barley fields changed steadily with increasing depth, and at a 36-in. depth still showed the same relations as in the surface soil. The difference in pH values between the limed and unlimed portions of the Rothamsted soil is substantially constant at all depths down to 36 in. The subsoils from these plats are highly flocculated. Mixtures of 1 part of soil with 5 parts of water exhibited complete flocculation in the case of all samples below 9 in., and the velocity of sedimentation decreased and the volume of the final sediment increased regularly and markedly with the depth. It is considered probable that such changes in soil texture constitute important factors in the action of a high surface acidity.

VI. *The interaction of acid soils, calcium carbonate and water, in relation to the determination of "lime requirements,"* E. M. Crowther and W. S. Martin (pp. 237–255).—These studies showed that the variations in the lime

requirement by the Hutchinson-MacLennan method with the amount of soil and calcium bicarbonate solution are connected with the buffer action of the soil. Indirect titration curves can be derived from the calcium bicarbonate results, and show a systematic divergence from the direct electrometric titration curves owing to the variable calcium concentration of the final bicarbonate solutions. In the presence of calcium chloride both methods show lower pH values for a given base absorption and yield almost identical titration curves.

"The Hutchinson-MacLennan 'lime requirement' is always less than the equivalent of the amount of calcium hydroxide necessary to give a neutral suspension in the electrometric titrations. The calcium bicarbonate solutions at equilibrium are always more acid than pH 6.2, but the 'salt effect' tends to give results corresponding to a somewhat higher degree of neutralization. 'Lime requirements' should be obtained by interpolation to some arbitrary concentration, and an empirical relationship is given by which the interpolation may be made from a single determination.

"The Hutchinson-MacLennan method can give no indication of the intensity of soil acidity, but serves to estimate the amount of lime necessary to give a considerable reduction of acidity. Calcium acetate and dicalcium phosphate give results of the same type as calcium bicarbonate. Calcium carbonate suspensions, containing phenol red or cresol red, show an almost instantaneous color change when poured on air-dry acid soil owing to the decomposition of calcium carbonate. The amount of acid, as free carbonic acid and calcium bicarbonate, liberated by the action of acid soil suspensions on calcium carbonate is greater than that estimated by the Hutchinson-MacLennan method, and still greater quantities are liberated by allowing water to percolate through intimate mixtures of soil and calcium carbonate."

Nitrogen losses in cows' urine, H. Dorsey (*Jour. Amer. Soc. Agron., 17 (1925), No. 8, pp. 489–492*).—Studies conducted at the Connecticut Storrs Experiment Station are reported which showed that urine does lose nitrogen, but that the loss under the conditions of the experiment during the entire summer was less than 50 per cent. Furthermore the nitrogen was very rapidly converted into ammonia, and it is thought that had the jars been uncovered so as to permit better aeration, the loss might have been quite different.

A kerosene layer reduced the loss of nitrogen about 40 per cent during the summer, and was far more effective than this for the first six months. The use of a small amount of acid phosphate appeared to increase the loss of nitrogen throughout the summer. Infection with liquid manure apparently had no significant effect.

Preliminary report on artificial or synthetic farmyard manure made in Southern Rhodesia under the Adco process, H. G. Mundy (*Rhodesia Agr. Jour., 22 (1925), No. 4, pp. 447–453, pls. 2*).—Tests of this patented process, using cornstalks as the vegetable matter, are briefly reported. Field trials with the artificial manures produced are said to have given satisfactory results.

Limitation of Student's method when applied to fertilizer experiments, W. W. Weir (*Jour. Agr. Research [U. S.], 31 (1925), No. 10, pp. 949–956*).—In a contribution from the U. S. D. A. Bureau of Soils some of the limitations of Student's method are illustrated when used in the interpretation of fertilizer results, and attention is drawn to certain precautions that should be taken in arriving at any mathematical expression of the significance or nonsignificance of one fertilizer treatment as compared with another.

Nitrogen availability studies on crops harvested at different stages of growth, G. H. Sinclair (*New Jersey Stas. Bul. 421 (1925), pp. 3–28, figs. 10*).—Studies on the efficiency of four nitrogenous fertilizers as indicated by their

effect on the nitrogen content of different plant families at various stages of growth are reported. The quantity of fertilizers used was varied to determine what influence this would have upon the nitrogen content and the percentage of nitrogen recovered. The crops were oats, millet, buckwheat, and rape.

The percentage of nitrogen in the plants studied decreased as they approached maturity, buckwheat, millet, and rape ranking in the order named in this connection when grown under similar conditions. It is considered probable that the time of year when plants are grown causes greater differences in the nitrogen content of the plants than would be found in plants of different families. The percentage of nitrogen was highest during the first three weeks of growth, ranging from 4 to 5.75 per cent in the dry matter.

The highest percentage of nitrogen was found in plants treated with calcium cyanamide. However, the yields of dry matter were smaller with this treatment than with any of the other treatments, and in most cases there was more or less injury. Plants treated with sodium nitrate and ammonium sulfate contained the same average percentage of nitrogen at the different stages of growth. Tankage was equal to sodium nitrate or ammouium sulfate in maintaining the nitrogen content of the plants until they were about half grown. After this time the nitrogen content was lower with tankage than with the other treatments.

Sodium nitrate gave the highest average yields of dry matter for the different periods of growth, followed in order by ammonium sulfate, tankage, and calcium cyanamide. The highest average recovery of nitrogen was with sodium nitrate, followed in order by ammonium sulfate, tankage, and calcium cynamide.

These results are taken to iudicate that plants use nitrogen very rapidly in the early stages of growth, and more efficiently when it is snpplied in readily available forms.

The phosphatic nodules of Trichinopoly and the availability of flour phosphate as a manure for paddy, M. R. Ramaswami Sivan (*India Dept. Agr. Mem., Chem. Ser., 7 (1925), No. 7, pp. VI+200, pls. 3, figs. 12*).—A description is given of the phosphate deposits of the Trichinopoly District, and the results of experimeuts on the use of Trichinopoly phosphate on paddy are reported.

It is stated that the deposits of phosphatic nodules in the district is 200 ft. deep and covers an area of about 10 square miles. The quantity is estimated at about 8,000,000 tons. The phosphate contains from about 56 to 59 per cent of tricalcium phosphate, 17 to 20 per cent of calcium carbonate, 7 per cent of iron oxide and alumina, and 7 per cent of silica. The nodules are said to be unsuitable for the manufacture of acid phosphate owing to the high content of calcium carbonate, iron oxide, and alumina.

Various experiments have shown that the flour of phosphate is slowly dissolved in paddy soils and becomes available to the paddy plant. The decomposition of organic matter in the form of green manure under swampy conditions of cultivation has also been found to result in the formation of sufficient quantities of carbonic acid to convert appreciable quantities of tricalcium phosphate into dicalcium aud monocalcium phosphates.

Studies of the availability of the phosphate in composts made with green manure and cattle manure showed that the solubility was greatest in 1-week composts and decreased in composts kept a longer time. There was a considerable diminution in the weight of the organic matter of such composts, indicating that it was largely decomposed during the composting period. These results are taken to indicate that flour of phosphate may be applied along with green manure at the time of puddling, so that the reversion may take place in the soil instead of in the manure heap.

Green manure was found to render the phosphate more available and to produce better crops than cattle manure. Increased quantities of the phosphate did not give increased crops either with or without green manure unless nitrogen, which was a limiting factor, was also supplied. The residual value of the flour of phosphate was found to be appreciable.

Further investigations on the yield increasing action of silicic acid in the presence of a phosphoric acid deficiency [trans. title], O. LEMMERMANN and H. WIESSMANN (*Ztschr. Pflanzenernähr. u. Düngung, 3 (1924), No. 5, Wirtschaft.-Prakt., pp. 185–197*).—Further studies on the subject are reported (E. S. R., 50, p. 425), which indicate again that silica is able to increase the activity of small additions of phosphoric acid. The cause of this action has not as yet been established.

Clumina, a new fertilizer [trans. title], D. LO MONACO (*Staz. Sper. Agr. Ital., 57 (1924), No. 4–6, pp. 213–239; abs. in Internatl. Rev. Sci. and Pract. Agr. [Rome], n. ser., 2 (1924), No. 4, pp. 860, 861*).—In view of the known effect of chlorine gas in the stimulation of seed germination, experiments on the value of chlorinated vegetable soil are briefly reported, the purpose being to prevent the caustic action of the gas on the germinating seed and yet not to interfere with the stimulating action.

It was found that vegetable soil after being treated with gas could be employed as a fertilizer on land sown with wheat. It was further found that when other substances besides vegetable mold were gassed their fertilizing value increased the more nitrogen they contained.

Commercial fertilizers, 1925, J. M. BARTLETT (*Maine Sta. Off. Insp. 117 (1925), pp. 29–52*).—Guaranties and actual analyses of 356 samples of fertilizers and fertilizer materials collected for inspection in Maine during 1925 are reported.

Inspection of commercial fertilizers, H. D. HASKINS, L. S. WALKER, and G. B. DALRYMPLE (*Massachusetts Sta. Control Ser. Bul. 33 (1925), pp. 38*).—Guaranties and actual analyses of 1,479 samples of fertilizers and fertilizer materials, representing 491 brands, collected for inspection in Massachusetts during 1925 are presented and discussed.

Inspection of agricultural lime products, H. D. HASKINS, L. S. WALKER, and G. B. DALRYMPLE (*Massachusetts Sta. Control Ser. Bul. 34 (1925), pp. 6, fig. 1*).—Guaranties and actual analyses of 20 samples of agricultural lime and 2 samples of gypsum collected for inspection in Massachusetts during 1925 are presented.

AGRICULTURAL BOTANY

The botany of crop plants, W. W. ROBBINS (*Philadelphia: P. Blakiston's Son & Co., 1924, 2. ed., [rev.], pp. XXI+674, figs. [264]*).—The alterations and inclusions which have become necessary since the issuance of the first edition of this volume (E. S. R., 37, p. 818) have not enlarged the mass of its material or altered its organization.

Plant anatomy, W. C. STEVENS (*Philadelphia: P. Blakiston's Son & Co., 1924, 4. ed., rev., pp. XV+398, figs. 155*).—The preparation of this edition has involved emendations where debated questions have arrived at or approached solution.

Bud and boll-shedding in cotton.—A preliminary enquiry, G. R. HILSON, V. R. AYYAR, and R. C. PILLAI (*Agr. Research Inst., Pusa, Bul. 156 (1925), pp. 34, pls. 8*).—This inquiry, instituted to ascertain the ratio of bolls matured to flower buds produced, with the object of isolating if possible a cotton with a low shedding index, was necessarily enlarged, in recognition of the large part

found to be played by insects, to include estimation of the percentage of shedding due to insect attack.

Methods and compilation plans are detailed as applied to the study of plants of the Cambodia variety (*Gossypium hirsutum*) and of Cambodia-like selections from a cross between this variety and Bourbon (*G. purpurascens*). The results are discussed in detail under the heads of bud production, flowering, bolling, and shedding.

It is shown that the majority of the buds and bolls shed are apparently unaffected by any pest or disease. It is pointed out that the damage done by the spotted bollworm is important from the point of view of yield and quality of produce.

The leaf-tissue fluids of Egyptian cottons, J. A. HARRIS, W. F. HOFFMAN, W. B. SINCLAIR, A. H. JOHNSON, and R. D. EVANS (*Jour. Agr. Research [U. S.], 31 (1925), No. 11, pp. 1027–1033*).—In a previous publication (E. S. R., 51, p. 331) it was shown that the physicochemical properties of the leaf tissues of Pima Egyptian cotton, a variety of American origin, differed from those of upland varieties with which they were compared. Additional studies were made to determine whether these differences were individual or characteristic of Egyptian varieties. The original Pima variety and five varieties recently introduced from Egypt were compared with Acala, Meade, and Lone Star upland varieties.

The results of the investigation indicate that while the Egyptian varieties apparently differed among themselves, all had a higher osmotic concentration and specific electrical conductivity than the upland varieties. All of the Egyptian forms had a higher chloride content and a lower sulfate content than the upland varieties. It is thought probable that differences between the individual varieties of the Egyptian type and between the individual varieties of the upland type may be demonstrated, but this will require additional investigation.

Study of osmotic pressure in plants in correlation with habitat and growth form [trans. title], J. W. PONT (*So. African Jour. Sci., 21 (1924), pp. 322–338, figs. 2*).—Studies on correlation between osmotic pressure and growth form and habitat of plants growing wild in the vicinity of Bloemfontein employed the methods used by Dixon (E. S. R., 33, p. 127) and by Atkins (E. S. R., 36, p. 429). Growth forms studied in connection with the correlated osmotic pressures, in atmospheres, of saps included mesophanerophytes and microphanerophytes, nanophanerophytes, chamaephytes, hemicryptophytes, geophytes, helophytes, therophytes, and stem succulents. The correlation between habitat and osmotic pressure was not marked.

Volume changes during plasmolysis [trans. title], H. WALTER (*Jahrb. Wiss. Bot., 62 (1923), No. 2, pp. 145–213, figs. 10*).—A study in plasmolytic change is described as carried out with algae, principally *Bangia fuscopurpurea*.

The production of plasmatic streaming movement [trans. title], H. FITTING (*Jahrb. Wiss. Bot., 64 (1925), No. 2, pp. 281–388, figs. 3*).—Among characteristic results of an extenstive research, here outlined, it is stated that leaf extract of Vallisneria induced protoplasmic movement in leaf cells of *Elodea densa* and of *E. callitrichoides*, Vallisneria having been chosen for these tests because of its own range of behavior as regards protoplasmic streaming, quiescence, and stimulability.

Light intensity and light sensitivity [trans. title], V. J. KONINGSBERGER (*Rec. Trav. Bot. Néerland., 20 (1923), pp. 257–312, figs. 10*).—This work employed a pure line oat variety and the method used in work previously noted (E. S. R., 51, p. 825).

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It is stated that sensitivity to a higher light intensity was not influenced by previous exposure to a lower intensity, whether for a few minutes or for many hours. Light intensity is a limiting factor for light growth reaction, in the sense that for each new intensity elevation a new growth reaction is produced. The growth acceleration that follows retardation is not connected with the characteristic reaction to illumination but appears to result from retardation, this antireaction being, apparently, an outward expression of autotropism. This autotropism can not be suppressed indefinitely at will (only for about 12 minutes). Superposition of repression occurs. Theoretical considerations are presented.

Quantitative studies regarding the effects of light on seed germination in Lythrum salicaria [trans. title], L. Rao (*Jahrb. Wiss. Bot.*, *64 (1925), No. 2, pp. 249–280, figs. 9*).—Certain relations between heating and illumination, as bearing upon seed germination, and the changes and limitations to which these relations are subject are quantitatively indicated.

Nitrogen metabolism in etiolated corn seedlings, S. L. Jodidi (*Jour. Agr. Research [U. S.], 31 (1925), No. 12, pp. 1149–1164*).—In order to throw some light on the physiological and chemical processes involved during the germination of corn seedlings, the author gives the results of a study of the nitrogen compounds of corn during its various stages of germination.

During the process of germination, in the absence of light, the proteins present in the corn grain were found to undergo disintegration rapidly, and within eight days 48 per cent of them were converted into water-soluble, diffusible nitrogen compounds. The disintegration is considered to take place through the activity of proteolytic enzymes, which are considered as preexistent in the resting corn seed. From the beginning of corn germination up to the eighth day there was a steady increase in acid-amide nitrogen and a decrease in humin nitrogen, and this is interpreted to mean that acid amides increase at the expense of certain amino acids. During the first eight days there was also a steady rise in amino nitrogen and a diminution in peptide nitrogen, and this is believed to indicate that amino acids increase at the expense of polypeptides, which are among the first degradation products of proteins.

Factors conditioning abnormal development in young potatoes [trans. title], S. J. Wellensiek (*Tijdschr. Plantenziekten, 30 (1924), No. 11, pp. 177–226, pls. 2*).—Tuber abnormalities and related conditions are here dealt with in systematic detail. Practical advice given includes keeping seed tubers cool and in full light and avoidance of too early planting.

Studies on geotropically stimulating materials [trans. title], H. Gradmann (*Jahrb. Wiss. Bot., 64 (1925), No. 2, pp. 201–248, figs. 6*).—This study is concerned largely with the origin and the distribution of geotropically stimulating substances and their specific effects.

Chemotropism in plant roots [trans. title], T. M. Porodko (*Jahrb. Wiss. Bot., 64 (1925), No. 3, pp. 450–508, figs. 3*).—This work indicates the present state of questions previously studied by the author (E. S. R., 32, p. 128), and contributes results from more recent studies.

On hydrotropism and thigmotropism of roots, C. E. B. Bremekamp (*So. African Jour. Sci., 21 (1924), pp. 258–264*).—This is a brief historical, critical, and experimental treatment, with arguments and suggestions.

The behavior of roots in moist air [trans. title], J. Kisser (*Jahrb. Wiss. Bot., 64 (1925), No. 3, pp. 416–439, figs. 2*).—Studies are outlined as carried out with cereals, legumes, and *Helianthus annuus*. Only restricted and imperfect root growth occurred in moist air. Modifications of this result by introducing and varying the substratum and other factors are indicated.

Growth and stimulability of root hairs [trans. title], K. SEIDEL (*Jahrb. Wiss. Bot.*, *63* (*1924*), *No. 3*, *pp. 501–552*, *pl. 1*, *figs. 2*).—The root hairs of different plants were found to be thigmotropic and highly plastic.

Increasing the activity of root nodules [trans. title], H. WUNSCHIK (*Centbl. Bakt.* [*etc.*], *2. Abt.*, *64* (*1925*), *No. 15–23*, *pp. 395–445*, *pls. 3*, *figs. 3*).—The most favorable nitrogen utilization goes on when complete correspondence has been reached between the vegetative energy of the plant and that of the nodule bacteria. The vegetative energy of the nodule-causing organisms increases by repeated adjustment to that of the host plant.

The value of litmus, brom-cresol purple, and Janus-green milk in a study of the nodule organisms of Leguminosae, J. W. STEVENS (*Jour. Agr. Research* [*U. S.*], *31* (*1925*), *No. 10*, *pp. 997–1000*).—In a previous publication (E. S. R., 44, p. 730) Löhnis and Hansen pointed out the value of milk as a culture medium for the differentiation of *Bacillus radiobacter* from the nodule bacteria of legumes. In an effort to improve the action of the milk, the present author added to the milk medium litmus, bromocresol purple, and Janus-green. Litmus proved the most valuable of the three materials tested. Litmus milk is said to bring out characteristics of the nodule bacteria not shown by plain milk. On the basis of reaction and reduction, it separates the organisms into two groups, and it is claimed that this separation is more marked with freshly isolated cultures than with cultures that have been carried in the laboratory for a considerable time.

On the production of pigment by Bacillus pyocyaneus in coloured light-fields: Its absorption spectrum, and that of plant pigments, J. S. VAN DER LINGEN (*Abs. in So. African Jour. Sci.*, *21* (*1924*), *pp. 151*, *152*, *pl. 1*).—In order to find any relation existing between pigment production and the nonlethal regions of the spectrum, agar slopes of *B. pyocyaneus* were placed behind glass plates colored red, orange, yellow, green, blue-green, and blue, and were ranged at a distance of 50 cm. from a 150-watt lamp. The organisms were allowed to develop for a few days, and the pigment was dissolved out of each tube with chloroform.

The results showed greater development of green pigment in the blue-green and orange fields than in either red or blue. Rechecking and addition of HCl for comparison of the resulting red colors confirmed these data. "The order of pigment production may be put as follows: Light, blue, red, green, yellow, blue-green, orange, dark. This is for the chloroform-soluble green pigment. In the dark, most pigment is always produced, whereas the least is produced in total light. With regard to the colored fields, most pigment is always produced in the orange and blue-green fields, and the least in either the red or the blue fields. In the remaining colored fields there does not seem to be any very marked difference. Both in the light field and in the red and blue fields the pigment seems to 'age' rapidly; that is, it turns brownish, and is then insoluble in chloroform." The absorption spectrum is particularly described, and an account is given of partial investigation of any relation between the absorption spectrum of the bacterial pigment and the anthocyanin in the violet-colored flowers of larkspur.

The function of the pigments of the chloroplast in the assimilation of carbon dioxide by plants, W. F. BARKER (*Abs. in So. African Jour. Sci.*, *21* (*1924*), *p. 314*).—In a presentation of a theory of the mechanism of carbon dioxide assimilation developed by the author in connection with Baly and Heilbron (E. S. R., 53, p. 125), evidence is advanced in support of the view that all four of the chloroplast pigments are necessary for the complete and smooth working of the assimilation mechanism. Tentative suggestions are put for-

ward as to the mode in which the different pigments function, and experimental evidence recently obtained in support of these suggestions is outlined. A complete account of the theory, its basis, and the evidence supporting it is promised as the result of certain experimental work in progress.

The carbon and nitrogen sources of some Fusariums [trans. title], H. H. Hochapfel (*Centbl. Bakt. [etc.], 2. Abt., 64 (1925), No. 8–14, pp. 174–222, figs. 3*).—Growth results with *Fusarium* spp. on different carbon or nitrogen sources are detailed, with discussion also of related contributions.

Aerobic and anaerobic respiration in plantlets of Pisum sativum [trans. title], D. S. Fernandes (*Rec. Trav. Bot. Néerland., 20 (1923), pp. 107–256, figs. 22; abs. in Nederland. Kruidk. Arch., Nederland. Bot. Ver., 1923, pp. 59, 60*).—An extended account is given of apparatus, material, preliminary treatment, related literature, experimentation, and results, with conclusions in considerable detail from each phase of this work on respiration in *P. sativum*. The relations are reported as found to hold, at different temperatures, between oxygen intake and carbon dioxide production.

Assimilation at different temperatures [trans. title], R. Harder (*Jahrb. Wiss. Bot., 64 (1924), No. 1, pp. 169–200, figs. 3*).—An attempt was made to ascertain precisely the influence of temperatures on plant assimilation by keeping under known conditions, alike except as to temperature (with modifications of illumination), *Elodea canadensis*, *Fontinalis antipyretica*, and species of Hypnum, Chara, and Cladophora. Temperatures of from 4 to 8 and 20° C. were employed, and assimilation was investigated after growth during three months. The results, as modified by illumination, are presented, with discussion.

GENETICS

Breeding work with field crops at the experiment stations, H. M. Steece (*U. S. Dept. Agr., Off. Expt. Stas., Work and Expend. Agr. Expt. Stas., 1924, pp. 43–59*).—Attention is called to inheritance studies carried on at the State experiment stations with the principal field crops, investigations concerned with the relation of the mode of reproduction to crop breeding, cytological studies, and the results of selection work and of breeding for special adaptations, such as for resistance to drought, cold, lodging, insects, and diseases (E. S. R., 54, p. 301).

Station work in horticultural breeding, J. W. Wellington (*U. S. Dept. Agr., Off. Expt. Stas., Work and Expend. Agr. Expt. Stas., 1924, pp. 61–65*).—A brief review of some of the results of the work of the experiment stations. See also an editorial discussion (E. S. R. 54, p. 301).

Investigations in animal genetics at the experiment stations, G. Haines (*U. S. Dept. Agr., Off. Expt. Stas., Work and Expend. Agr. Expt. Stas., 1924, pp. 67–87*).—A brief review of the investigations in animal genetics which have been conducted by the State agricultural experiment stations, including an extensive bibliography. See also an editiorial discussion (E. S. R., 54, p. 301).

Symposium on species and chromosomes (*Amer. Nat., 59 (1925), No. 662, pp. 193–224*).—Below are noted, from this and other publications, most of the contributions which were presented at the symposium on the general subject of species and chromosomes which was held at the Toronto (1924) meeting of the British Association for the Advancement of Science.

Species and chromosomes, R. R. Gates (pp. 193–200).—The study of chromosomes, furnishing fundamental evidence in the tracing of phylogenies, should be recognized as an essential element in the discrimination of genera and species.

Chromosomes and classification in the genus Rosa, K. B. Blackburn (pp. 200–205).—*Rosa* spp. provided suitable material for the study of chromosomes, and some data and inferences are outlined.

Chromosomes and species, O. Rosenberg (pp. 205–208).—A discussion is given of the characterization of a species by a certain number of chromosomes.

Polyploidy and the origin of species, E. C. Jeffrey (pp. 209–217).—Attention is focused on the Rosaceae as represented by Rosa, Rubus, and Crataegus.

Some remarks on species and chromosomes, C. H. Ostenfeld (pp. 217, 218).—Accepting chromosome number as an additional and important element in the classification of a form, the author maintains also the importance of other newly ascertained characters as criteria.

Animal parthenogenesis in relation to chromosomes and species, A. D. Peacock (pp. 218–224).—This paper deals with the question whether there is any connection between the emergence, through hybridization, of new forms and the emergence, through hybridization, of a new method of propagation of these novelties. Data and inferences presented, though chiefly on the animal side, are thought to have wider applicability.

Species and chromosomes, R. R. GATES (*Nature* [*London*], *114* (*1924*), *No. 2862, pp. 353–356*).—This is a somewhat briefer statement by the author than that above noted.

Fracture of chromosomes in rye, J. BELLING (*Jour. Heredity, 16* (*1925*), *No. 10, p. 360, figs. 3*).—Similar to the cases reported by Gotoh (E. S. R., 53, p. 426), plants from a rye field in Long Island, N. Y., also showed either seven pairs of chromosomes or eight pairs. In one case, all the grains of a spike had germinated together, and those plants examined had eight pairs of chromosomes.

Cytological studies on some garden varieties of Canna, Y. TOKUGAWA and Y. KUWADA (*Japan. Jour. Bot., 2* (*1924*), *No. 3, pp. 157–173, pl. 1, figs. 7*).—Investigations conducted at the Tokugawa Biological Institute, Tokyo, upon 18 varieties of ornamental Canna gave chromosome counts in the root tip tissue of either 18 or 27. With three exceptions, Eldorado, Halley Comet, and Black Warrior, the process of meiosis was found to be quite abnormal, rendering difficult the exact counting of the chromosomes. An examination of the pollen grains in several varieties showed a varying amount of sterility, the Mrs. Alfred F. Conard, Venus, Dr. Nansen, and Eldorado varieties showing the lowest proportion of sterile grains. These and Black Prince were the only varieties to produce seed naturally.

In attempting to correlate somatic characters with the number of chromosomes, the authors found that the foliar stomata were generally somewhat smaller in diploid than in triploid varieties. The staminodia of the triploid plants were not only larger but also presented a delicate, wavy appearance in their surface. The flowers of the triploid plants were conspicuously larger than those of the diploid plants, and in height the triploids were significantly taller. These observations led the authors to conclude that the somatic characters in the triploid plants are generally larger than in the diploid, though the differences are not proportional to the number of chromosomes.

Studies on an ever-segregating race in Portulaca grandiflora, N. ENOMOTO (*Japan. Jour. Bot., 1* (*1923*), *No. 4, pp. 137–151*).—The occurrence has been reported variously of some new types which are always heterozygous, never breeding true to type, as in yellow mice, beaded Drosophila, and *Oenothera rubrinervis*. Their occurrence has been explained as due to the incompatibility (or prohibition) of gametes or else to the death of the dominant zygotes, either with or without the assumption of a lethal factor. A case analogous to that of

the second class above indicated has been observed and studied, and the results are detailed in the present paper as to genetical behavior, with inferences.

A genetic analysis of maize, L. J. STADLER (*Missouri Sta. Bul. 236 (1926), pp. 54, 55*).—Further investigations (E. S. R., 53, p. 426) were concerned with linkage and crossing-over in corn.

Determination of crossover percentages for the *C-Sh* and *Sh-Wx* regions in 54 plants of a full sibship showed crossovers to be about 13 per cent more frequent in male gametes than in female gametes of the same plants. There was no significant correlation between the crossover percentage in gametes of the two sexes in the same plant. The significant differences found in inflorescences of different sex may probably result from the different conditions under which their gametes are developed rather than from any constant difference in the mechanism of crossing-over in the two sexes.

Results of successive pollinations made from four plants at intervals of one or two days throughout the pollen-shedding season indicated that no consistent variation in crossing-over appeared with age. The fluctuations of the crossover percentage for the *C-Sh* region were not noticeably correlated with those of the percentage for the *Sh-Wx* region. Crossover percentages determined by pollinations from the tassels of transplanted tillers were not significantly different from those of other tassels of the same plant. In female gametes, on the other hand, crossover percentages in main stalks and tillers differed widely and significantly. The crossover percentages in the tassels of the main stalk and of the first tiller did not differ significantly.

The crossing-over in the development of male gametes in 59 plants of a full sibship, and for the female gametes of 63 plants was found to be only moderately variable. Percentages determined for the short *C-Sh* region were much more variable than those for the long *Sh-Wx* region. Crossover variations in male gametes were correlated slightly and negatively with date of first pollen but were not correlated with plant height, number of ears, or number of tillers, whereas the reverse seemed to be true in female gametes.

The genetics of sex in hemp, H. C. MCPHEE (*Jour. Agr. Research [U. S.], 31 (1925), No. 10, pp. 935–943*).—Distinct vegetative and sexual dimorphism exists in hemp, the vegetative differences being the same for plants remaining sexually pure and for those later producing some flowers of the opposite sex. The two sex types occur in about a 1 : 1 ratio. Under certain conditions both sex types produce flowers of the opposite sex. The most decisive factor in causing this change is the relative length of day and night, according to experiments (E. S. R., 52, p. 525) at the Bussey Institution and in the U. S. Department of Agriculture.

When staminate and carpellate individuals were crossed, the progeny consisted of staminate and carpellate in equal numbers. When the carpellate was selfed or pollinated with pollen from another carpellate type individual, the progeny were all carpellate. The seeds produced on a staminate plant gave rise to both sex types. The author holds that sex determination in hemp can be explained on a genetic basis, and that the inheritance is of the *XY* type.

Inheritance of color in crosses between the various breeds of the domestic turkey, W. R. B. ROBERTSON (*Missouri Sta. Bul. 236 (1926), p. 88*).—In studies of the heredity of colors in the various breeds of turkeys it was found that factors for black (*Bl*), bronze (*Br*), Narragansett (*Nar*), and Bourbon red (*R*) form a series of allelomorphs, or that they are so closely linked that no crossing-over would be observed in the small numbers produced. *BlBr* and *BlNar* birds were black with a few bronze feathers. *BlR* birds were

rusty black with a slight trace of barring with white in the wing feathers and with brown in the rest of the plumage. The latter birds mated inter se produced the expected 1:2:1 ratio of black, rusty, and red offspring. A dilution factor (*Sl*), a pigmentation factor (*C*), and an intensity factor (*Dr*) appear to be independent of the allelomorphic series.

The factors of the albino series of guinea pigs and their effects on black and yellow pigmentation, S. Wright (*Genetics, 10 (1925), No. 3, pp. 223–260, figs. 5*).—This is a complete account of the experiments in which the action of the five allelomorphic factors in the albino series in guinea pigs (E. S. R., 49, p. 368) was determined at the Bureau of Animal Industry, U. S. D. A. In conducting the study the sepia series of colors has been graded from 3 for a light sepia to 14 for an intense black, and the yellow series from 3 for light cream to 13 for the most intense red. The *C* factor appears to be dominant to all others, but some variation was evident in the intensity of the yellow of 2 of the inbred lines, both of which are intense. The following table gives a summary of the approximate coat and eye color and the average grades of the yellow and black coat color as affected by different combinations of the factors of this series:

The effect of the factors of the albino series on yellow and black coat color and eye color

Genotype	Yellow fur		Black fur		Eye color
	Color	Average grade	Color	Average grade	
C	Red	10.6	Black	14.0	Black.
c^kc^k	Yellow	7.1	Dark sepia	13.1	Black.
c^kc^d	Yellow	7.2	Dark sepia	12.4	Black.
c^dc^d	Yellow	7.0	Medium sepia	9.9	Black.
c^kc^r	Cream	4.6	Dark sepia	13.5	Black.
c^dc^r	Cream	4.1	Dark sepia	12.1	Black.
c^kc^a	Cream	4.6	Dark sepia	11.5	Black.
c^dc^a	Cream	4.2	Medium sepia	7.0	Black.
c^rc^r	White	0	Dark sepia	13.1	Red.
c^rc^a	White	0	Medium sepia	8.5	Red.
c^ac^a	White	0	White	0	Pink.

It is pointed out that the order of intensity in yellow and black pigmentation is unmistakably different. Several hypotheses are discussed in explanation, from which it appeared that the two genes in the zygote affect pigment production independently. The relative effects of the different genes on yellow and black are suggested as the grade of intensity produced by each factor when combined with c^a. The physiological action of factors in the albino series determines the rate of some fundamental process for all pigmentation, while irregularities in the order of the effect on different kinds of pigment and in different regions of the body are due to physiological processes independent of the albino series. Yellow pigmentation in the fur seems to interfere with black in the guinea-pig series, but there is no such interference in the determination of eye color.

The action of the dilution factor *f*, referred to in the earlier paper, is also discussed in relation to the other factors, as stock carrying this gene is not included in the data. The offspring of one male which was clearly a germinal as well as a somatic mosaic offered the only clear exception to the ordinary mode of inheritance of the five allelomorphs.

Studies on vigor.—IV, The effect of testicle grafts on spontaneous activity, R. G. Hoskins (*Endocrinology, 9 (1925), No. 4, pp. 277–296, figs. 2*).—After a review of the literature dealing with the permanency and effect of testis grafts in animals and man, the effect of subcutaneous injections and pocket grafts of testicles on the spontaneous activity of castrated rats is reported. The activity was determined as in the preceding study (E. S. R., 54, p. 229).

The results of three such experiments failed to give evidence of any increased activity following implantation of the grafts. Inspection and palpitation in the live animals indicated that the grafts were largely or completely resorbed.

Activity studies on male castrated rats with ovarian transplants, and correlation of the activity with the histology of the grafts, G. H. Wang, C. P. Richter, and A. F. Guttmacher (*Amer. Jour. Physiol., 73 (1925), No. 3, pp. 581–599, figs. 7*).—In continuing the studies of the relation of the voluntary activity to sex in rats (E. S. R., 53, p. 573), 24 males were castrated at from 27 to 90 days of age. Ovarian tissue was implanted at from 10 to 25 days thereafter in the recti muscles.

All of the males showed marked decreases in voluntary activity following castration. After the ovarian grafts were made 17 of the castrated animals showed increased activity varying from 1.03 to 116 times the activity preceding the transplantations. Four showed characteristics of the 4-day oestrus cycle, and 9 others showed irregular cycles. The body weights were also found to be more like females than like males.

The ovarian grafts were later removed, and the voluntary activity was thus diminished about 90 per cent and marked increases in the body weight were apparent. From studies of the grafts after removal there appeared to be no consistent correlation between the degree of feminization, the extent of activity, or the degree of specificity of the weight curve and the histological normalcy of the transplanted ovaries. The presence of the ovarian tissue was, however, demonstrated in all animals showing stimulation in their activity or a decrease in body weight, and the grafts were completely absorbed in those showing neither effect.

Studies on the physiology of reproduction in birds.—XX, Reciprocal size changes of gonads and thyroids in relation to season and ovulation rate in pigeons, O. Riddle (*Amer. Jour. Physiol., 73 (1925), No. 1, pp. 5–16*).—The gonad weights of pigeons used for determinations of the seasonal changes in thyroid weight in an earlier study (E. S. R., 53, p. 834) are reported for the three groups, common pigeons, generic hybrids, and ring doves. The data were taken from healthy birds divided into three groups, and are reported according to the season and age of the birds at the time they were killed.

It was found that the autumn and winter, the time of increased thyroid size, were accompanied by a decrease in the size of the gonads in both sexes, while the reverse relations occurred in the spring and summer. The mean increase in size during the later periods was 18.2 per cent for the testicles and 20.8 per cent for the ovaries. The seasons of most frequent ovulation both in the common pigeon and ring dove were determined as spring and summer. Fifteen birds of each breed, which were given an opportunity to lay a maximum number of eggs, were used for making these determinations.

Restricted egg production and a large percentage of single eggs were associated with the enlargement of the thyroid. The average amount of thyroid tissue in relation to the amount of ovarian tissue in the common pigeon was also greater than in ring doves or generic hybrids, and the rate of egg production was markedly less in the first species. It is suggested that the apparent antagonism of the thyroids and gonads may depend upon the opposed action of the thyroid and suprarenal glands.

FIELD CROPS

Control of soil heterogeneity and use of the probable error concept in plant breeding studies, H. K. Hayes (*Minnesota Sta. Tech. Bul. 30 (1925), pp. 3–21*).—The present paper is largely a consideration of the "deviation from the mean method" of computing probable errors used for several years by the author. This method resembles the pairing method outlined by Wood and Stratton (E. S. R., 24, p. 633) in that it permits all plats of all varieties in the test to be used in computing the probable error of the experiment, i. e., the probable error which represents soil heterogeneity and other nonsystematic errors. The method of calculation and the use of the probable error obtained are presented, together with results indicating the extent of error in rod-row trials resulting from the failure to use the correlation coefficient in obtaining the probable error of a difference. The methods developed by Student and others are also dealt with.

"The use of Student's method for varietal trials conducted for several years is not entirely satisfactory as there is no sure control or measure of soil heterogeneity unless the comparisons are made on the basis of adjacent plats. Student's method is valuable for trials where it may be expected that if there is a difference in yielding ability the difference will be consistent from year to year. Such consistence is not commonly obtained in varietal tests. Differences which are a result of varietal resistance or susceptibility and which are only apparent under disease-infection conditions may be present only once in every three or four seasons. Student's method used for seasonal averages tends to cover up important differences. By the deviation from the mean method calculated on the basis of numerous strains the odds that two varieties were different in yielding ability for a four- and five-year trial, respectively, were much greater than where Student's method was used and seasonal averages were compared.

"Adjustment of yields by the regression equation on the basis of a moving average leads to a reduction in the probable error of the experiment providing soil heterogeneity is a factor. If the extent of soil heterogeneity as measured by the correlation coefficient is 0.6 or lower and if the probable error of a single determination is 10 per cent or less, adjustment of yields will, as a rule, not markedly change the relative standing of varieties. Such changes as occur will be of little importance on the average. An estimate of the extent of soil heterogeneity may be accomplished by placing the yields of each separate set of replications of individual strains on a percentage basis with 100 as an average. By the correlation of yielding ability of plats which are separated by any particular number of intervening plats the extent of soil heterogeneity may be measured. By placing a similar series of varieties on each of two fields the one with the least soil heterogeneity can be selected for permanent nursery experiments."

Growth-equation constants in crop studies, W. L. Gaines and W. B. Nevens (*Jour. Agr. Research [U. S.], 31 (1925), No. 10, pp. 973–985, figs. 9*).—Studies at the Illinois Experiment Station on the growth of sunflowers and of corn have been noted earlier (E. S. R., 53, p. 533) from another source.

Electroculture, L. J. Briggs, A. B. Campbell, R. H. Heald, and L. H. Flint (*U. S. Dept. Agr. Bul. 1379 (1926), pp. 35, fig. 1*).—Electrocultural experiments were conducted at the Arlington, Va., Experiment Farm during eight years to determine the effect of a highly charged network on the yield of crops growing under it. The general technique resembled that employed in English experiments in which the electrical treatment is reported to have given increased yields.

A well-defined increase in the yield of cowpeas, soy beans, and winter rye due to electrical treatment was not apparent, although there was an indication of a slight increase in the yield of wheat when grown under a positively charged network. However, the increase observed lay within the experimental error, as did the effect of an electric charge on the transpiration rate and the water requirement of plants in plant house experiments.

The use of electrocultural methods in their present state of development is not recommended as a practical means of increasing the yield of crops in this country. An extensive review of other investigations in electroculture did not lend assurance of great progress.

Farm and garden crops (*Kans. State Bd. Agr., Bien. Rpt., 24 (1923–24), pp. 212–262, figs. 18*).—Articles embraced in this group include What's the Matter with Alfalfa? by L. E. Call; Corn Is King, by F. D. Tomson; Weed Seed Identification, by E. P. Harling; Sweet Clover and Idle Acres, by I. D. Graham; Diversify with Fruits and Vegetables, by H. H. Haymaker; Brome Grass in Kansas, by R. W. Kiser and J. V. Hepler; and Cotton in Kansas, by H. H. Lande.

[Field crops investigations in Missouri, 1924–25], W. C. Etheridge, C. A. Helm, L. J. Stadler, B. M. King, R. T. Kirkpatrick, J. T. Quinn, and T. J. Talbert (*Missouri Sta. Bul. 236 (1926), pp. 52–54, 55–58, 60, 61*).—Classification work with soy beans, breeding work with wheat, varietal studies with wheat, soy beans, oats, and cowpeas, kafir yields in rotations, and cultivation tests with barley are reported on as heretofore (E. S. R., 53, p. 431).

The comparison of soy beans and cowpeas in yield gave results similar to those reported during the last 6 years. The forage yields of 64 pure lines of Wilson soy beans ranged from 3,771 to 4,659 lbs. of cured hay (12 per cent moisture) per acre, and the seed yields of 64 pure lines of Midwest soy beans varied from 14.7 to 23.1 bu. per acre. A detailed study of the morphological characters of the pure lines of Midwest soy beans showed that although many characters were highly correlated with yield as determined by the usual method, these correlations were almost entirely environmental. The only characters germinally correlated with yield significantly were number of nodes (main stalk) $r=+0.261\pm0.083$, diameter of stalk $+0.272\pm0.082$, and weight per 100 beans -0.355 ± 0.077. The negative correlation of weight of seed with yield, if consistently found in repeated trials, may be valuable in selection. When Wilson and Midwest soy beans, representing widely different types, were sown for hay at rates ranging from 40 to 120 lbs. of seed per acre, the lower rates were found the most economical, since no important variation in yield occurred. However, with the heavier rates of seeding, the proportion of weeds, especially crab grass, decreased in the crop, resulting in a better quality of hay.

The fertilizer treatments giving consistent and significant increases in cotton yields caused an average gain of about 40 lbs. of lint, or a net return of about $5 per acre. On the deep sandy soil of the southeast Missouri lowlands spacings providing for 2 to 4 plants in hills 10 in. apart excelled, while on silt loam or silty clay loam soils tending to produce tall, rank growing plants, similar yields were had from single plants 12 in. apart and from 2 to 4 plants in hills 12 in. apart. Of the best yielding varieties, Trice and Delfos were generally superior on heavy soils, and Express and Acala on the lighter soils.

Application of commercial fertilizers did not materially increase the acre yield of sweet potatoes, nor did vine growth differ where different forms of fertilizer were used. Analyses of the sweet potato indicated that different fertilizers may affect the starch and sugar contents. A varietal variation for total sugars and starch was noted in the Nancy Hall and Yellow Jersey

varieties. Commercial fertilizers in no way seemed to affect the keeping qualities of the sweet potato in storage.

Certified northern-grown seed potatoes continued to produce more profitable returns than noncertified northern seed. Fall home-grown potatoes used as seed produced within a few bushels of the northern-grown seed. Differences as high as 85 bu. per acre were produced by different strains of the same potato variety from four Northern States. Plantings from March 20 to May 10 showed early planting to be one of the principal factors in potato production. The hot formaldehyde seed treatment, 1 pt. of commercial formaldehyde to 15 gal. of water heated to 122 to 124° F. and continued for 4 minutes, gave the best control for Rhizoctonia, blackleg, and common scab.

[Agronomic work in Wyoming] (*Wyoming Sta. Rpt. 1925, pp. 76, 77, 90, 91, 92*).—Red Bobs, Marquis, and Kota spring wheat, and Trebi, Odessa, California Feed, and Hannchen barleys were prominent among the cereal varieties. A rotation including sweet clover 2 years, potatoes 1 year, and small grain 1 year followed by the application of well-rotted manure has increased potato yields. Small potato seed pieces gave only about a 50 per cent stand in a cold, wet spring, while half and whole potatoes gave an almost perfect stand.

In experiments at Archer (E. S. R., 48, p. 734) with methods of producing winter wheat, a 30 per cent increase resulted when the furrow drill instead of the common drill was used on late plowed fallow. Late fallow was greatly superior to early fallow for winter wheat. A strain of early sunflowers developed by selection matures from 20 to 30 days earlier than strains generally used in southeastern Wyoming.

Treating potato seed for scab and black scurf increased yields 25 per cent at Torrington. Seed from dry land produced 40 per cent more yield the first year under irrigation than potatoes saved from that crop and planted a second year under irrigation. Wyoming-grown certified seed potatoes outyielded certified seed from the North-Central States.

Methods of conducting local variety tests [trans. title], R. Torssell (*Sveriges Utsädesför. Tidskr., 35 (1925), Nos. 1, pp. 26–38; 3, pp. 118–138*).—The topics considered in the discussion presented include the arrangement of tests on the field, seed and seeding, arrangement of plats in the individual test, management of the test during the growing period, harvesting, and threshing. The formula for seeding the plats is given and explained, and the results of other investigators in this subject are briefly noted. A bibliography of 39 European entries is given.

Plant fibers, E. Schilling (*Die Faserstoffe des Pflanzenreiches. Leipzig: S. Hirzel, 1924, pp. VIII+320*).—More than 1,900 species of fiber plants are listed in this work, which describes the characteristics of the more important species. In addition to general information on utilization, botanical origin, and nomenclature, the plant fibers are classified as to their uses and according to families and genera. A bibliography of 460 titles is appended.

Third report on the experiments on the influence of soil, season, and manuring on the quality and growth of barley, 1924, E. J. Russell (*Jour. Inst. Brewing, 31 (1925), No. 11, pp. 548–561*).—The third season of the series (E. S. R., 52, p. 530) was remarkable for its prolonged wetness, its lack of sunshine, and its protracted harvest.

Considering results obtained at 14 centers in England, the addition of a nitrogenous fertilizer has on most soils led to an increase in crop, averaging 5.4 bu. per hundredweight of ammonium sulfate. Increases were obtained whether the barley was grown after a straw crop, after roots fed off, or after potato and beet crops. The use of 3 cwt. of superphosphate per acre

was followed by only a slight and unprofitable response after a straw crop or after potatoes and beets and none whatever after roots fed off. The use of potassium sulfate has given small crop increases after potatoes, less after roots fed off, and none after a straw crop.

The influence of nitrogen, potassium, and phosphorus on valuation was slight. The results to date suggest that farmers using a good modern variety of barley can aim at the biggest crop that will stand, using the appropriate fertilizer without fear of loss of valuation. There was only a slight connection in 1924 between nitrogen content of grain and valuation. As usual, the complete fertilizer lowered the percentage of nitrogen in the grain as compared with no fertilizer. Contrary to previous years the omission of nitrogenous fertilizer was without effect or actually increased the nitrogen content of the grain. Omission of phosphorus and of potassium generally increased the nitrogen content of the barley without depressing the value. In every test at Rothamsted the valuation of the barley has been raised and its nitrogen content lowered by using ammonium chloride instead of ammonium sulfate.

Third report on the influence of soil, season, and manuring on the quality and growth of barley of the 1924 crop as indicated by the malts made therefrom, H. M. LANCASTER (*Jour. Inst. Brewing, 31 (1925), No. 12, pp. 601, 602*).—Malting tests and analyses made on the barleys described above are tabulated.

The distinguishing characters of Prentice and Abed Rex barley [trans. title], E. HELLBO (*Tidsskr. Planteavl, 31 (1925), No. 4, pp. 659–666, figs. 4*).—A statistical study of the length of kernel and pedicel and of the relation between these two factors in these varieties is reported. The average results of all measurements gave a kernel length of 8.1 mm. for both varieties but a pedicel length of 3.2 mm. for Prentice and of 4.1 mm. for Abed Rex. A botanical description of the kernels of the two varieties is given.

Svalöf Brage barley [trans. title], H. TEDIN (*Sveriges Utsädesför. Tidskr., 35 (1925), No. 1, pp. 8–17*).—The origin and history of this new two-rowed variety are described, and its quality and productive capacity on the basis of tests conducted in different parts of Sweden are compared with several leading sorts. In 42 tests the average yields of Brage in each of three localities were from 8.2 to 9.6 per cent above those of Chevalier II, but the results of 158 tests distributed over a much larger territory were not so decisive in a comparison with Prinsess and Gullkorn. In average straw production and in weight per bushel in other series of tests Brage ranked above these varieties.

Cotton experiments at Florence, E. E. HALL and G. M. ARMSTRONG (*South Carolina Sta. Bul. 225 (1926), pp. 4–31, figs. 12*).—Cleveland strains have averaged highest among the short staple varieties, and Carolina Foster, Delfos, and Lightning Express led the long staples in cotton experiments (E. S. R., 54, p. 637). Spacings with 1 plant per hill at 6, 9, and 12 in. apart gave the most cotton at the first picking and the greatest total yield when protected from weevil with calcium arsenate. A 6-in. spacing yielded best when only presquare poison was used. With more than 1 stalk per hill, combinations averaging 1 stalk every 6 in. in 4-ft. rows gave the earliest crop and largest total yield.

Seed delinted with sulfuric acid gave earlier stands and higher yields than did seed with other treatments. Plantings made the first week in April resulted in the best average yield. On deep sandy soil, sodium nitrate gave best results when applied as side applications soon after chopping. Sodium nitrate applied at different times did not produce a great variation in yield on soil with clay subsoil. Topping cotton at any growth stage was not beneficial, the greatest yield decrease occurring from topping at the beginning of square production.

Delaying thinning much beyond the regular chopping time resulted in a decreased yield.

Report on a cultivation experiment with irrigated cotton in 'Iraq, R. THOMAS and K. SAWHNEY (*Iraq [Mesopotamia] Dept. Agr. Mem. 9 (1925), pp. [2]+22*).—In an irrigation test with cotton conducted during 5 years at Rustam near Bagdad, ridged cotton during comparable periods averaged 23.5 per cent more seed cotton than flat planted plats and 17.9 per cent more than flat planted plats subsequently ridged. Ridged plats were characterized by their more vigorous vegetative development, greater production of flowers and bolls, and lower rate of shedding.

Flax improvement and flax experiments at Svalöf [trans. title], N. SYLVÉN (*Sveriges Utsädesför. Tidskr., 34 (1924), No. 3, pp. 103–125, figs. 10*).—The flax improvement work begun at Svalöf in 1918 is described in detail, and the yields of straw and seed of the different varieties and strains are given in tables. The highest average yield of straw for 1922 and 1923, 5,179 kg. per hectare (4,609 lbs. per acre), was produced by a strain derived from a Russian variety and designated as No. 21–1919. The average yield ranking next, 5,070.7 kg. per hectare, was produced by a strain from a Svalöf variety, No. 594–1920. These yields were, respectively, 56.1 and 52.9 per cent above the yields secured from an unimproved Svalöf variety. The important strains, as a rule, produced less seed than the unimproved Svalöf variety used as a standard.

Pacific coast species of Lathyrus, R. V. BRADSHAW (*Bot. Gaz., 80 (1925), No. 3, pp. 233–261, figs. 29*).—About 35 species and subspecies of Lathyrus found on the Pacific coast of North America are described.

[Potato investigations in Latvia], K. ROZE (*[Latvia] Lauksaimniecības Pārvaldes Rakstu Krājums No. 1 (1925), pp. 66, figs. 28*).—Experiments during the period 1922–1924 showed medium late varieties of potatoes to outyield late varieties under local conditions. On mineral soils Parnassia, Deodara, and Silesia led in starch production, while Pepo, Deodara, and Parnassia gave the highest yields of tubers. On marshy soils Parnassia, Deodara, and Jubel excelled in starch production, while Jubel, Deodara, and Pepo produced the most potatoes. Pepo and Jubel gave the heaviest tubers, averaging 60–70 gm., Deodara and Parnassia medium tubers averaging 50–65 gm., and Silesia and Merker tubers averaging 30–40 gm. in weight.

A 40-cm. (15.7 in.) spacing in 60-cm. rows seemed preferable with local varieties. Decrease in starch content accompanied 50-cm. and wider spacing between hills. Medium weight (50–60 gm.) tubers were best for seed, and whole tubers were better than cut tubers.

Local varieties could not utilize large quantities of fertilizer as well as the newer sorts. Of the potassium salts, potassium sulfate and potassium-magnesium sulfate have given the best crop as regards the quantity of tubers and the starch content.

Potatoes stored in heaps lost only 6 per cent during winter, while the loss in cellars reached 21.2 per cent. The starch lost during winter did not exceed 1 per cent of the quantity present in autumn.

[Potato variety tests on moor soils], H. WITTE (*Svenska Mosskulturför. Tidskr., 38 (1924), No. 4, pp. 233–260, figs. 3*).—The results of a test of 14 varieties of potatoes, conducted at Flahult from 1919 to 1923, inclusive, are reported.

The average yield for the entire period was 33 tons per hectare (13.36 tons per acre), the range in yield for the different varieties being from 29.6 to 39.2 tons and for the different years from 28.2 to 37.5 tons per hectare. The average quantity of starch produced for the five years was 4,100 kg. per hectare (3,649 lbs. per acre), the range of production for the varieties being from 3,100

to 4,720 kg. and for the years from 3,450 to 4,560 kg. per hectare. The earliest varieties, as a rule, ranked highest in the production of tubers and of starch. The highest tuber yields were produced by the varieties Harbinger, Midsommar, Non Plus Ultra, Sharpes Express, and Makalös, and the highest starch yields by Harbinger, Sharpes Express, Midsommar, Makalös, and Svalöf Eldorado, in the order mentioned. Svalöf Eldorado, Makalös, Gertrud, and Sharpes Express led in starch content.

[Variety tests with potatoes, 1918–1924], G. NILSSON (*Sveriges Utsädesför. Tidskr., 35 (1925), No. 1, pp. 18–25, fig. 1*).—The results of a test of 14 varieties of potatoes, including several newly originated strains and conducted at the Swedish Seed Association Experiment Station in Värmland, are presented and discussed. Brief descriptions of the different varieties are given.

Svalöf Brita led the early varieties in yield and in resistance to late blight, and Harbinger, somewhat later, was second. Svalöf Birgitta, the outstanding medium early variety for the locality, averaged from 17 to 19 per cent above Up-to-Date in yield. Svalöf Magnum Superbum did not yield so high as Up-to-Date, but kept much better. Well adapted varieties grown for feed produced from 8,000 to 9,000 feed units per hectare (3,238 to 3,644 feed units per acre), a feed unit being equivalent to 1 kg. of mixed concentrates.

Distinguishing seed characters of English and Italian rye grass and of rye grass and meadow fescue [trans. title], E. HELLBO (*Tidsskr. Planteavl, 31 (1925), No. 4, pp. 667–675, figs. 6*).—The seed characters of the different grasses are described and figured. The descriptions are based on the results of a study of material submitted to the State Seed Control Service for examination.

Varietal experiments with soybeans, R. J. GARBER, T. E. ODLAND, T. C. MCILVAINE, and K. S. QUISENBERRY (*West Virginia Sta. Bul. 196 (1925), pp. 16, figs. 2*).—Haberlandt, Peking, Peking 1–21–8, Peking 1–21–7, Virginia, Wilson, and Hamilton soy beans produced relatively high acre yields of hay and satisfactory seed yields during 4 years at the station. At Maggie, Virginia, Sherwood, Maryland No. 19186–B, Royal, and Haberlandt produced the highest 3-year average yields of hay; and Hamilton, S. P. I. 36902, Haberlandt, Elton, and Wilson led in seed production. Three Peking selections retained their leaves relatively longer than any other varieties tested.

Mineral composition of sunflowers grown for silage, R. E. NEIDIG and R. S. SNYDER (*Jour. Agr. Research [U. S.], 31 (1925), No. 12, pp. 1165–1171, figs. 3*).—In further analyses made on material studied earlier (E. S. R., 49, p. 770) at the Idaho Experiment Station, the data indicated that sunflowers draw very heavily on the potassium and calcium and to some extent on the magnesium of the soil, using more of these bases than does corn. Sunflowers and corn take about the same amounts of the other elements out of the soil. "The reason that low yields of crops sometimes follow sunflowers may be due to the heavy draft which a sunflower crop makes on the soluble minerals of the soil, a heavy crop of sunflowers requiring especially a large supply of potassium and calcium. It is readily seen, therefore, that sunflowers, when grown, should be included in a rotation."

Self-pollination of sweet clover, L. E. KIRK (*Sci. Agr., 6 (1925), No. 4, pp. 109–112, fig. 3*).—*Melilotus alba* plants inclosed in cotton cages during pollination studies at the University of Saskatchewan produced an average of 34.9 pods per raceme as compared with 66.4 pods per raceme in open-pollinated plants. With *M. officinalis* the production averaged 2.6 and 63.9 pods, respectively. Protected from insects by glassine bags *M. alba* produced 15.79 pods and *M. officinalis* 0.04 pod.

The author concludes that *M. alba* is highly self-fertile and will set seed freely without insect visitation. *M. officinalis* is probably unable to set seed freely unless cross-pollinated by insects, or it may be so sensitive to conditions incident to caging with cotton or glassine that seed setting is prevented when insects are thus excluded.

Tobacco, D. E. DIGGES (*Canada Expt. Farms, Harrow (Ont.) Sta. Rpt. Supt. 1924, pp. 3–18*).—Supplementing previous work (E. S. R., 53, p. 340), this report gives the details of experiments with tobacco during 1924 at the Harrow, Ont., Experimental Station, concerned with seed beds and transplanting, harvesting and curing studies, variety trials, fertilizer tests, cropping methods, and comparison of home-grown v. imported seed.

Experiments with Swedish turnip seed produced from small and large seed roots [trans. title], E. LINDHARD (*Tidsskr. Planteavl, 31 (1925), No. 4, pp. 608–640*).—Experiments conducted during periods between the years from 1910 to 1923, inclusive, are described in detail, and the results are discussed mainly as to their bearing on seed root selection and strain improvement and maintenance.

The average results of all experiments show that seed from roots 50 per cent above the average size, or of an average weight of 1.62 kg. each, produced 1,100 kg. of roots per hectare (979 lbs. per acre) more than were secured from seed produced by roots of average size or having an average weight of 1.11 kg. per root; but the dry matter content of the roots of the first group was reduced. Similar results were had in earlier work with mangels. The results suggested a possible change in type of strain in the direction of a lower dry matter content by a continued selection of the largest roots for seed production. A strain is apparently best preserved by not selecting too strictly for size but by retaining a comparatively high percentage of roots conforming to the type.

Germination of frozen and nonfrozen wheat harvested at various stages of maturity, W. O. WHITCOMB and P. F. SHARP (*Jour. Agr. Research* [*U. S.*], *31 (1925), No. 12, pp. 1179–1188, pls. 4*).—Marquis wheat, harvested at various stages of maturity near the Montana Experiment Station, was in part subjected in the spikes for 48 hours to temperatures ranging from —20° to —28° C. (—4 to —18.4° F.)

The nonfrozen wheat at all the development stages studied gave almost complete germination. The pronounced effect of aging on the germination of frozen wheat was shown clearly, the germination being at first relatively low, increasing to a maximum, and then decreasing, so that at the end of a year the germination was again relatively low. The germination of the wheat which was riper at the time of frost was less affected by freezing than was that of the more immature wheat. If frosted wheat is to be used for seed the authors think that it should be tested for germination immediately before seeding.

The influence of nitrate nitrogen upon the protein content and yield of wheat, E. BURKE (*Jour. Agr. Research* [*U. S.*], *31 (1925), No. 12, pp. 1189–1199, figs. 3.*)—An investigation at the Montana Experiment Station during the period 1911–1917 was concerned with the influence of nitrate nitrogen in the soil on the protein content and yields of winter and spring wheat grown continuously and alternating with fallow.

Plats alternated with fallow and crop produced more spring and winter wheat per acre and contained on an average more moisture to a depth of 3 ft. than similar plats cropped continuously. The moisture content differed most with spring wheat when plants were making most rapid growth and with winter wheat when the soil was well supplied with moisture and before the plants made most rapid growth. Plats alternating fallow and crop contained

more nitrate nitrogen during the cropped year than plats cropped continuously, which may account for the alternating plats producing straw and grain with the higher nitrogen contents.

Nitrate nitrogen in the alternate fallow and crop plats decreased more in parts per million in the cropped years than in the continuously cropped plats, partly due to leaching and partly because the wheat plants took nitrates from the soil faster than they were formed. The fact that the fallow plats always produced larger yields and grain with a higher protein content than the plats cropped continuously seemed to indicate that nitrate nitrogen is a significant factor in controlling yields and quality of wheat in Montana.

The Kansas seed law (*Kans. State Bd. Agr. Bul., 1 (1925), No. 1, pp. 16, figs. 3*).—The text of the Kansas seed law effective July 1, 1925, is given, with rules and regulations for its enforcement.

Report of analyses of samples of seed collected in New York State, 1924 (*N. Y. State Dept. Farms and Markets, Agr. Bul. 176 (1925), pp. 59*).—The purity and weed seed content and germination, as shown by analyses at the New York State Experiment Station, are tabulated for 526 samples of agricultural seed and 53 samples of seed mixtures collected during 1924.

British weeds, R. Morse and R. Palmer (*London: Ernest Benn, 1925, pp. 207, pls. 8, figs. 32*).—Part 1 of this handbook gives the usual information on the dissemination, control, and identification of weeds, with a key to British weeds. In part 2, the plants are described with control methods, being grouped as weeds of arable land and of meadows and pastures; of lawns, golf greens, and garden paths; and of ponds, lakes, and water courses. The appendixes deal with the useful weeds, noxious weeds, herbicides, weed manuals, and the systematic classification of weeds.

HORTICULTURE

Some genetic phases of horticultural development, M. J. Dorsey (*Amer. Soc. Hort. Sci. Proc., 21 (1924), pp. 302–309*).—Asserting that plant improvement in the United States is merely in its beginning, the author discusses the past and present status of horticultural breeding, pointing out the weak points in our prominent varieties and suggesting ideals to be aimed at in future work.

[Horticultural investigations at the Missouri Station], T. J. Talbert et al. (*Missouri Sta. Bul. 236 (1926), pp. 59, 60, 61, 62, 63, fig. 1*).—In this, the usual annual report (E. S. R., 53, p. 436), H. D. Hooker and H. G. Swartwout again discuss the changes in composition occurring in young Jonathan trees as a result of pruning and sodium nitrate applications (E. S. R., 53, p. 38). Studies with annually and biennially fruiting York trees showed the latter to be deficient in carbohydrates in the on-year and in nitrates in the off-year. Fall applications of nitrogen had some effect in modifying these deficiences.

Studies of the fruiting habits of grapes showed that canes from wood from 3 to 5 years old were more productive than from younger or older wood. In vines trained to the four-arm Kniffin system, buds on the two upper canes were more productive than the corresponding buds on the lower canes. The region of maximum productivity was found to vary with the varieties from the fifth to the tenth nodes. In respect to diameters, the most productive canes were those ranging between ¼ and ½ in. between the third and fourth nodes. Basal adventitious buds produced less fruit and smaller clusters than did the ordinary nodal buds.

In fertilizer studies with cantaloupes, conducted by J. T. Quinn, barnyard manure applied at the rate of 5 tons per acre was approximately as effective as 500 lbs. of a 3–12–4 fertilizer.

Observations by A. E. Murneek upon seedling apples bred for late blossoming revealed some having this characteristic in a high degree. Marked differences in fire blight susceptibility were also noted.

In investigations by T. J. Talbert, Hooker, and Swartwout upon spray materials, it was found that the so-called Missouri cold-mix lubricating oil emulsions were not only less expensive, easier to prepare, and more stable than boiled oil soap emulsions, but were also compatible with any standard spray mixture. Lubricating oil emulsions in which the oil concentration was less than 5 per cent did not injure dormant deciduous fruit trees. Lowering the concentration of oil allowed the oil emulsion sprays to be used with lime sulfur and Bordeaux mixture in the preblossoming period and with many varieties in the postblossoming period. Bordeaux mixture 3-4-50 applied from 10 to 14 days after the calyx spray caused severe burning. Bordeaux also tended to reduce the growth of leaves and fruit in the apple. Dry lime sulfur, when used in greater strengths than recommended by the manufacturer, gave equally as good results as the liquid form.

Talbert found that patch, ring, and spur budding are generally more successful than cleft or whip grafting in pecan and hickory propagation. In 4 or 5 years grafted walnut trees attained a size and productivity comparable to unworked trees.

The chemical composition of insecticides and fungicides, R. H. Robinson and W. W. Yates (*Oregon Sta. Circ. 64 (1925), pp. 3–15*).—Herein are presented the results of analyses of various insecticides and fungicides offered for sale in Oregon in 1924–25.

Effect of time of planting and fertilizers on the yield of vegetables, G. Briggs (*Guam Sta. Bul. 5 (1926), pp. 27*).—A summary of six years' records, 1915–1920, taken on time of planting and upon fertilizer tests with various native and introduced vegetables. Despite the tropical climate, it was found that most of the species had an optimum planting season. In nearly all cases plantings made during the extremely dry season and during periods of excessive rainfall were failures. In most instances application of fertilizer gave profitable increases in yield. Data for the individual species and varieties are presented in tabular form. Shading plats of peppers with coconut leaves placed on frames more than doubled the yield.

The relation of size of kernels in sweet corn to evenness of maturity, I. C. Hoffman (*Jour. Agr. Research [U. S.], 31 (1925), No. 11, pp. 1043–1053, pl. 1, fig. 1*).—Studies at the Indiana Experiment Station showed that kernel size, especially in the Country Gentleman variety, has an important influence upon the size, character, and yielding capacity of the resulting plants. Although germinating about the same time as the small, the large kernels nearly always produced larger seedlings. The plants from the large kernels grew more rapidly and reached tasseling, pollen-shedding, full-silk, and canning stages about five days in advance of the plants from the small kernels. Hence, it is recommended that, if for no other reason than that of uniform ripening, sweet corn seed designed for canning purposes should be graded according to size. No difference was found in the size of the kernels produced on ears resulting from the different sized seeds. It was noted that a larger number of 2-eared stalks occurred in the large-seeded lots. At the same time, more barren and unproductive stalks appeared in the lots resulting from small seeds. Furthermore, the plants from large seeds were apparently more resistant to adverse weather conditions.

Fruit tree manual, D. E. Ribera Gómez (*Manual sobre Árboles Frutales. Paris: Garnier Hermanos, [1925], pp. 235, figs. 53*).—This pocket manual con-

tains information concerning the physiology of the growth and flowering of fruit trees, and offers practical suggestions concerning propagation, pruning, culture, varieties, etc.

Fruit bud formation, V. R. GARDNER (*Mich. State Hort. Soc. Ann. Rpt., 54* (*1924*), *pp. 53–58*).—A summary in nontechnical language of the present status of knowledge concerning fruit-bud formation, with suggestions of a practical nature for the use of the fruit grower.

The origin of secondary dormant buds in deciduous fruit trees, B. HAHNE (*Calif. Univ. Pubs. Bot., 13* (*1926*), *No. 5, pp. 125, 126, pl. 1*).—Incidental to a microchemical study of the seasonal fluctuations in the reserve foods of the pear tree, the author found that the bud pith, added to each year by an amount of tissue more or less equal in length to the radial increment of the growth ring, is capable of branching during or after the second year. Thus two or more dormant buds may be present at the surface where only one originally existed.

The influence of various systems of root and top pruning, time of planting, and method of planting on the growth of the orchard the first year, E. C. AUCHTER (*Peninsula Hort. Soc.* [*Del.*] *Trans., 39* (*1925*), *pp. 19–26*).—Records taken at the University of Maryland upon young apple and peach trees planted at different times in the year and subjected to various treatments at the time of planting led to the following observations:

For both 1- and 2-year-old apple trees December 10 planting was practically as effective as April 1. However, trees planted in February and in late April did not develop satisfactorily. With the peach, April 1 was decidedly superior to earlier or later dates. Ramming the earth about the roots of both apple and peach trees gave decidedly unsatisfactory results. Under the conditions obtaining, namely, heavy soil and abundant rains, trees whose roots were loosely covered did quite as well as those about which the soil was tamped at planting time. A comparison of none, medium, and very hard root pruning upon 1-year apple and peach trees was decidedly to the advantage of no pruning in both species. Very hard pruning was distinctly harmful. To determine the relation between root and top pruning at time of planting 2-year apple trees were treated in various manners. The results suggested that in trees of this size the roots should be pruned very little, if any, but that the top should be headed back moderately.

Some unusual results in fertilizing fruit plants, J. K. SHAW (*Amer. Soc. Hort. Sci. Proc., 21* (*1924*), *pp. 281–286*).—Growth records taken upon apples, peaches, and grapes planted in 1922 on plats at the Massachusetts Experiment Station, which for about 30 years had received fixed annual applications of fertilizer, failed to show any such differences as might have been anticipated. Of the three fruits, the peach alone showed any response to fertilizers, and only on the limed potash plats was there any unusual growth. On the unlimed potash plats peach growth increases were not deemed significant, and on the nonpotash plats the limed portions were in general inferior to the unlimed. Growth on the check areas, which had received no fertilizer for 35 years, was satisfactory, with little or no evidence that added nitrogen benefited the trees. Determinations of total nitrogen in the shoots showed the highest content in trees making the least growth and, conversely, the lowest in trees making the best growth.

Observations on cover crop development on the various areas showed the best rye to be on the nitrogen-phosphorus and complete fertilizer plats. Buckwheat made the best growth on the nitrogen-phosphorus area. Records taken on the peach fruit-bud formation in the spring of 1923 showed the greatest number of bud-bearing shoots on the complete fertilizer plats.

The manufacture, translocation, storage, and utilization of carbohydrates in the tree, H. D. HOOKER (*Mich. State Hort. Soc. Ann. Rpt., 54 (1924), pp. 46–53*).—Pointing out the important rôle that carbohydrates assume in the life of plants, the author discusses carbohydrate formation, movement within the tree, storage, and utilization, particularly as influenced by the presence of available nitrates.

The intake, translocation, and use of mineral nutrients in the tree, F. G. GUSTAFSON (*Mich. State Hort. Soc. Ann. Rpt., 54 (1924), pp. 39–46*).—A discussion of the physiological aspects of plant nutrition, with special reference to the fruit tree.

Performance record of apple trees over a ten year period, M. J. DORSEY and H. E. KNOWLTON (*Amer. Soc. Hort. Sci. Proc., 21 (1924), pp. 337–342*).—In presenting individual tree records taken by the West Virginia Experiment Station for 10 consecutive years in a block of 150 apple trees of the Grimes, Ben Davis, and York Imperial varieties, the authors point out that certain trees have been decidedly unproductive throughout the entire period. Although many of these drone trees were unthrifty, some were healthy and vigorous. Soil heterogeneity is deemed to be the principal cause of variability in yields in this orchard. That other factors were also concerned was shown in records of check trees. Two adjacent trees, both making a trunk growth gain of 12 in., yielded 3 and 1,731 lbs. of fruit, respectively, in 10 years. Applications of nitrogen reduced but failed to eliminate the number of low-yielding trees. It is suggested that multiplicity in stocks and perhaps in scions may have contributed to the variability in yields.

Habits of growth and bearing of apple varieties as related to biennial bearing, W. B. MACK (*Amer. Soc. Hort. Sci. Proc., 21 (1924), pp. 296–300*).—In presenting conclusions reached in an analysis of growth and performance records taken on 46 trees of 9 apple varieties, including typical biennial and annual bearers, the author reports that no indication was obtained that the biennial habit could be broken up by modifying the vigor of the tree. Spur growth was not found to be closely associated with terminal growth, and, under normal conditions, relatively more terminals were formed in the on year. It is believed that the control of biennial bearing lies in preventing excessive fruit setting by blossom thinning or other means. Heavy production in biennial bearers was found to induce biennial fruiting.

Annual crops from biennial bearing apple trees, B. D. DRAIN (*Amer. Soc. Hort. Sci. Proc., 21 (1924), pp. 300–302*).—Of various chemicals tested as media for reducing the number of blossoms to set on apple trees, iron sulfate was found most promising, especially when applied as a fine spray, under high pressure, and used at the rate of 0.25 oz. to 1 gal. of water. The pistils were found to be more susceptible to iron sulfate injury than the leaves. An examination in October of McIntosh spurs upon which all blossoms were killed by iron sulfate in the preceding spring showed 32.5 per cent of the spurs to have formed fruit buds.

The injurious effect of submergence of the cranberry plant, S. WAKABAYASHI (*New Jersey Stas. Bul. 420 (1925), pp. 3–26, figs. 4*).—Studies of the nature and causes of injury to the cranberry plant and fruits resulting from flooding indicated that the problem is essentially a question of oxygen supply. In early June, submerged and shaded plants supplied with oxygen from an outside source suffered no injury, while comparable shaded plants were severely harmed. Determinations showed the oxygen content in the shaded, untreated vessel to be promptly depleted and to remain thus throughout the test.

Tests showed that the oxygen necessary for respiration during the period of submergence could be supplied from various outside sources: (1) Directly as

gas, (2) in the form of hydrogen peroxide, (3) as bicarbonates, carbon dioxide solution, or carbon dioxide gas passed directly through the water. The bicarbonates, carbon dioxide solution, and carbon dioxide gas evidently favorably affected photosynthetic activity.

An examination of plants covered with bog water to different depths showed increasing injury associated with increased depth. At the same time the oxygen content of the water was found to decrease with increased depth. Observations on the results of flooding at different stages in the plant's life showed the injurious period to be in the spring months. Flooding for more than 24 hours immediately before blooming was certain to cause injury. The blossoms and very young fruits were easily killed. In August and September, submergence injury was apparently caused by increased fungus activity rather than the lack of oxygen. Fall flooding in 1922 caused fruit injuries ranging from 10 to 15 per cent. Winter flooding, even when maintained for several months, caused no injury whatsoever.

Garden irises, B. Y. Morrison (*U. S. Dept. Agr., Farmers' Bul. 1406 (1926), pp. II+46, figs. 54*).—A comprehensive discussion, including taxonomy, utilization, propagation, hybridization, exhibitions, control of insect and fungus pests, etc.

FORESTRY

A preliminary study of the growth of noble fir, E. J. Hanzlik (*Jour. Agr. Research [U. S.], 31 (1925), No. 10, pp. 929–934, figs. 2*).—Data recorded on noble fir trees found in a mature Oregon forest composed of noble and Douglas firs, western hemlock, and a scattering of amabilis fir showed that on such favorable sites this species is capable of remarkable development. In trees averaging 400 years of age, the average diameter at breast height was 49.4 in. and the average height 196.3 ft. The best growth was apparently attained in direct competition with a rather intolerant species, such as Douglas fir.

Noble fir seedlings were seldom found under shade, suggesting that cutting should take place in the spring following a good seed year. Germination occurred on bare mineral soil and on duff, preferably the latter. Measurements of seedling growth showed the species to be slower in height increment than either Douglas fir or western hemlock. Comparative volume tables computed for noble fir, Douglas fir, and western hemlock showed that noble fir, due to its long cylindrical bole and thin bark, had the greatest volume for a given diameter at breast height.

Studies in western yellow pine nursery practice, D. R. Brewster and J. A. Larsen (*Jour. Agr. Research [U. S.], 31 (1925), No. 12, pp. 1101–1120, figs. 5*).—Observations taken on the amount and character of germination on experimental seed beds of western yellow pine showed that shallow soil covers favor rapid and larger total germination, lower mortality, and better plant development. On the average, the best results were attained with ¼ and ⅜-in. coverings. Comparing drill with broadcast sowing, the results were consistently in favor of the latter, not only in economy of seed but in higher germination, higher survival, and better plant development. In respect to shade. duplicate experiments conducted in two successive seasons, one moist and favorable and the other hot and dry, showed definitely that the largest and most rapid germination, the highest survival, and the best growth are obtained without shade. The application of water to seed beds resulted in larger plants, not equal, however, to those resulting from a combination of watering and tillage. The authors believe that beds should be watered heavily at rather infrequent intervals, but advise that, where water is relatively inaccessible, satisfactory results may be obtained by drill sowing and cultivation.

Yield capacities of the pure yellow pine type on the east slope of the Sierra Nevada Mountains in California, S. B. SHOW (*Jour. Agr. Research [U. S.], 31 (1925), No. 12, pp. 1121–1135, figs. 11*).—Measurements taken in practically pure yellow pine stands located in that portion of the Lassen National Forest lying east of the Sierra Nevada Mountains in California indicated that, by preserving the young growth already on the ground, yields up to 40,000 board feet per acre may be obtained. The mean annual increment reached its highest level at an age of from 120 to 130 years, indicating a rotation of approximately 120 years. Data taken on white fir stands indicated that this species is capable of attaining on a given site a greater average maturity height than yellow pine. The methods of technique employed in the study are discussed in considerable detail.

Some possible errors in the use of curves, D. BRUCE (*Jour. Agr. Research [U. S.], 31 (1925), No. 10, pp. 923–928, figs. 6*).—From an analysis of the individual measurements of diameter at breast height, height, and volume of 524 second-growth long-leaf pine trees, the author shows the possibility of errors occurring when the independent and dependent variables in curves based upon empirical data are interchanged, although the substitutions would appear to be algebraically correct. The errors are due to the lack of perfect correlation. In the same way errors result from correlating variables on the basis of the correlation of each with the same third variable. The accuracy of such calculations is directly dependent upon the degree of correlation between the variables.

Forest fire control, J. MCLAREN (*U. S. Dept. Agr., Misc. Circ. 44 (1925), pp. II+14, figs. 4*).—Following a brief discussion of the tremendous losses due to man-caused fires, brief directions are presented for preventing and suppressing forest fires.

When fire is banished from the land of the white oak (*U. S. Dept. Agr., Misc. Circ. 53 (1925), pp. 10, figs. 7*).—A brief article pointing out the importance of the Ozark National Forest as a permanent source of white oak lumber and urging the necessity of reducing forest fires, which cause serious damage annually in this region.

DISEASES OF PLANTS

Principles of plant pathology, I, II, C. E. OWENS (*Ann Arbor, Mich.: Edwards Bros., 1924, pts. 1, pp. VIII+126; 2, pp. 127–414*).—The subject matter of this manual, selected to meet the needs of students in agriculture for a general course dealing with plant diseases and their control, is in two parts. The first part presents material of general interest regarding the nature, cause, and control of plant diseases. The second part contains a series of exercises covering representative types of plant diseases, selected to represent a wide field, both as to causal agent and as to host. Under each disease listed, the exercise falls into the three subdivisions of directions for laboratory work, text discussion of the disease, and a selected list of references to original literature on the subject.

To economize time in study extensive and duly credited quotations from original sources have been brought together. Literature lists conclude the several chapters.

[Report of the Missouri Station department of] botany (*Missouri Sta. Bul. 236 (1926), pp. 44, 45*).—A report is given of a study by W. J. Robbins of the relation between the isoelectric point previously found for the potato tuber tissue as pH 6.4 (E. S. R., 53, p. 442) and the toxicity of anions and cations. It was found that the cyanide anion and acid dyes were more injurious to

potato tuber tissue in solutions acid to pH 6.4 than they were in solutions alkaline to pH 6.4. The sodium cation and basic dyes were more injurious to potato tissue in solutions alkaline to pH 6.4 than in solutions acid to pH 6.4. Cations were more injurious on the acid side of pH 6.4 than would be expected if potato tuber tissue acted like a single protein. The conclusion is drawn that H-ion concentration is an important factor in determining the toxicity of ions, and the isoelectric point for plant tissue is of significance in determining the reactions at which cations and anions evidence their maximum toxic effect.

Previous experiments by I. T. Scott, in an attempt made to render soil unfavorable for infection of tomatoes by *Fusarium lycopersici* through the addition of lime, having shown that when applied to only the upper 2 or 3 in. lime had little effect in adjusting the soil reaction in the region of the growing roots (E. S. R., 53, p. 442), the experiments were repeated in 1924 except that lime at the rate of from 3 to 4 tons per acre was thoroughly incorporated with the soil to a depth of 8 or 9 in. and tomato seedlings inoculated with cultures of the organism were planted in the treated soil. Comparisons were made with plants grown in untreated soils and in soils to which sulfur was added at the rate of from 400 to 600 lbs. per acre. The initial reactions of the soils were changed from pH 5.2 to 5.3 to pH 7.6 to 8 for the limed soils and pH 4.8 to 5 for the soils to which sulfur was added.

At the end of the experiment, which was terminated in about 72 days, marked differences were observed in the amount of wilt developed under the different treatments. Much of the fruit taken from the check and sulfur-treated plats was small and of poor grade due to premature ripening on badly wilted vines. From 70.2 to 74.2 per cent of the vines on the limed plats showed wilting, but in about 50 per cent of these plants only 1 or 2 branches showed pronounced wilting. The check plants and those on the sulfur-treated plats had wilted completely at this time. It is considered evident that in order to effect reaction of the soil it is necessary to incorporate lime with the upper 8 or 9 in. of the surface soil.

A species of Fusarium is reported as closely associated with a blighting of alfalfa plants that has been under observation for some time.

Continued investigation of varietal resistance to wheat scab has shown several strains of wheat that are considered promising in resistance to infection by *Gibberella saubinetii*.

A brief account is given of a spot of King David apples which was under observation during 1923 and 1924. Preliminary investigations by Scott are said to have shown that the spotting occurred on fruit approaching maturity during late summer, and the disease is characterized by the occurrence of circular, dark brown to black slightly sunken spots from 2 to 8 mm. in diameter, usually centered about a lenticel and more abundant on the side of the fruit exposed to the sun. No causal organism has been found associated with this disease, and it is considered that probably the spotting is of a physiological nature.

Report of the Dominion botanist for the year 1924, H. T. Güssow et al. (*Canada Expt. Farms, Div. Bot. Rpt. 1924, pp. 78, figs. 5*).—Among the matters systematically presented in this report prominence is given to increased facilities, centering at Winnipeg, for the study of wheat rust problems, and to the cooperation in this work with the National Research Council and western universities and colleges.

Botrytis diseases in Washington, B. F. Dana (*Abs. in Phytopathology, 13 (1923), No. 11, p. 509*).—The author reports the following diseases occurring in Washington caused by *B. cinerea:* Apple fruit rot; carrot storage rot; cran-

berry fruit rot; fig canker; ginseng moldy seed; gooseberry die-back; lettuce gray mold; lilac leaf blight; peony blight; pear, plum, raspberry, and strawberry fruit rots; and squash storage rot. Onion neck rot caused by *B. alii;* peony blight, *B. paeoniae;* and tulip blight, *B. parasitica,* have also been observed within the State. Undetermined species of Botrytis have been found causing eggplant fruit rot, goldenseal leaf blight, periwinkle leaf blight, rose blossom blight, and snowball blossom blight.

The production by Fusarium solani of a toxic excretory substance capable of causing wilting in plants, T. FAHMY (*Phytopathology, 13 (1923), No. 12, pp. 543–550*).—A study was made of *F. solani* to determine whether it produces toxic substances capable of causing wilting in plants and the nature of such substances if present.

When grown under artificial conditions *F. solani* was found to produce a toxic diffusible substance which increases in concentration with the age of the culture. This toxic substance was found to produce a rapid wilting of cut bean stems when these were placed in the filtrate of the fungus. The culture is said to become alkaline due to the growth of the fungus, the degree of alkalinity increasing with the age of the culture, but the alkalinity is not considered responsible for the wilting. Ammonia and oxalate were also produced by the fungus, but neither was found present in sufficient quantity to explain the toxic action of the solution. The unknown substance responsible for the wilting is said to be thermostable and nonvolatile.

Some possible relationships of the mosaic diseases, H. A. ALLARD (*Phytopathology, 13 (1923), No. 12, pp. 555–557*).—The author calls attention to our lack of knowledge regarding the nature of the infective agent of mosaic, the actual relation of mosaic diseases of different plants, and the means by which the infective agent is carried over winter. Several lines for further study are indicated.

Physiological studies on the genus Phytophthora, L. H. LEONIAN (*Amer. Jour. Bot., 12 (1925), No. 7, pp. 444–498, pls. 13, figs. 7; also West Virginia Sta. Sci. Paper 11 (1925), pp. [55], pls. 13, figs. 7*).—The author made a physiological study of 53 strains of Phytophthora representing most of the described species of the genus as a basis for their grouping. As a result of his investigations, the number of species is reduced to 18, one of which, *P. pini,* a parasite on roots of *Pinus resinosa,* is described as new.

According to the author, *Pythiacystis citrophthora* is a true Phytophthora. He also considers *P. phaseoli* a variety of *P. infestans,* and that *P. colocasiae, P. palmivora, P. faberi, P. parasitica* and its variety *rhei, P. terrestris,* and Reddick's Phytophthora should all be referred to *P. omnivora.*

A key, based upon physiological reactions, is given.

A new disease of cultivated barley in California caused by Helminthosporium californicum n. sp., W. W. MACKIE and G. E. PAXTON (*Phytopathology, 13 (1923), No. 12, p. 562*).—A technical description is given of *H. californicum* n. sp., which is said to cause a rusty blotch of barley in California. Marked varietal differences in resistance to the disease are noted.

Foot-rot or Ophiobolus in California, W. W. MACKIE (*Phytopathology, 13 (1923), No. 12, pp. 561, 562*).—The widespread occurrence of *O. graminis* on wheat and barley in California is reported.

An effective method of inoculating barley with covered smut, W. H. TISDALE (*Phytopathology, 13 (1923), No. 12, pp. 551–554*).—A method is described by which the author was able to inoculate barley with smut. In his work the hulls were removed by breaking the basal or rachis end of the glumes from over the embryo and removing the remaining parts with a knife. The removal of the hulls was found very effective in producing infection.

Control of smuts of wheat and oats, with special reference to dust treatments, R. C. THOMAS (*Ohio Sta. Bul. 390 (1925), pp. 405–423, figs. 8*).—The results are given of experiments for the control of smuts of wheat and oats in which comparisons were made on the effect of treatments with formaldehyde and various dusts. For the control of loose smut of wheat the hot water method is recommended. For the other smut diseases dust treatments, particularly those with copper carbonate and with other salts used in connection with corrosive sublimate, gave satisfactory control. The addition of inert fillers reduced the efficiency of all fungicides. Detailed directions are given for the different treatments recommended.

Control of smuts on cereal crops, H. L. BOLLEY (*North Dakota Sta. Circ. 28 (1926), pp. 14, figs. 8*).—Popular descriptions and suggestions for control are given of smuts affecting cereals in North Dakota.

Fungi isolated from the interior of cotton seed, R. F. CRAWFORD (*Phytopathology, 13 (1923), No. 11, pp. 501–503*).—In a study of seed-borne diseases the author isolated from cotton seed *Fusarium vasinfectum*, three unidentified species of Fusarium, a species of Colletotrichum, *Diplodia gossypii*, and species of Cephalothecium and Alternaria. Inoculation experiments conducted with most of the organisms showed the ability of the fungi to cause disease under certain conditions.

Diseases of cucumbers, G. F. WEBER (*Florida Sta. Bul. 177 (1925), pp. 25–71, figs. 33*).—Descriptions are given of a number of cucumber diseases in Florida. Their occurrence and seasonal development are discussed, and methods are suggested for their control. Where fungicides are adapted, the use of a 4–4–50 Bordeaux mixture or copper lime dust is recommended, the former being somewhat less expensive. Seed treatment with corrosive sublimate is recommended for the control of all seed-borne diseases, and roguing, clean cultivation, and rotating of crops are suggested as means for the control of diseases not yielding to the application of fungicides.

Notes on the anthracnose of lettuce, C. S. PARKER (*Abs. in Phytopathology, 13 (1923), No. 11, p. 510*).—The author reports the inoculation of prickly lettuce (*Lactuca scariola*) from pure cultures of *Marsonia panattoniana.*

The critical temperature for infection of the potato seed piece by Fusarium oxysporum, H. G. MACMILLAN and G. A. MECKSTROTH (*Jour. Agr. Research [U. S.], 31 (1925), No. 10, pp. 917–921*).—In an attempt to ascertain the critical temperature for the infection of potato tubers with *F. oxysporum*, temperature tanks were used, and seed pieces were heavily inoculated with cultures of the organism.

Under approximately normal conditions and at constant temperatures, seed pieces from potatoes of only moderate resistance were infected by *F. oxysporum* at approximately 14° C., (57.2° F.) but not at lower temperatures.

Notes on Rhizoctonia, B. F. DANA (*Abs. in Phytopathology, 13 (1923), No. 11, p. 509*).—Experimental work with potatoes at the Washington Experiment Station is said to have shown that selection of visibly clean seed stock will give the largest quantity of table stock. If the clean seed is treated with mercuric chloride the yield of clean tubers will be increased. For the treatment of potatoes mercuric chloride is said to have proved superior to formaldehyde for the control of Rhizoctonia. Spraying with Bordeaux mixture and soil fertilizer treatments did not consistently increase the yield or percentage of clean tubers. Late spring plantings are said to have given a higher yield of clean tubers from infected seed than early spring plantings under the same conditions.

Preliminary results with the use of sulfur for the control of potato scab in Idaho, J. M. Raeder (*Abs. in Phytopathology, 13 (1923), No. 11, p. 512*).—A brief account is given of the experiments for the control of potato scab in soil the average pH value of which was 6.74. Through the application of sulfur the pH value of the soil in some plats was materially reduced, but the results so far as the control of scab is concerned are said to have been negative.

Potato spraying vs. dusting in New Jersey, W. H. Martin (*Potato Assoc. Amer. Proc., 11 (1924), pp. 67–74*).—In trials during a 10-year period potato increases reaching 95 bu. and averaging 30 bu. per acre were obtained. In order to test the comparative values of dusting and spraying, a series was started in 1921 to compare copper lime dusts with Bordeaux mixture for control of potato diseases and insects. In every case, whatever the fungus or insect present, the use of Bordeaux gave greater yield increases than did the use of copper lime dusts, the average increase for all varieties during the 4-year period being 1.4 per cent for the dusted and 13.9 per cent for the sprayed plats.

Potato dusting . . . in Vermont, J. A. Dimock (*Potato Assoc. Amer. Proc., 11 (1924), pp. 74–76*).—This is an account of the results observed during seven years on the use of copper lime dust for potatoes in commercial fields. For five years of this time practically no diseased potatoes were seen. Rather serious loss in 1922 from late blight is ascribed to lack of timeliness and thoroughness in applying the dust. It is conceded that conditions may occur under which it may prove impossible to maintain complete control of potato disease.

On the preparation of mercuric chloride solutions, J. T. Rosa (*Potato Assoc. Amer. Proc., 11 (1924), pp. 113–115*).—"Stock solution of mercuric chloride can be prepared very quickly with warm water by adding an equal weight of sodium or ammonium chloride. Fairly quick solution can be obtained with cold water by adding four times as much sodium or ammonium chloride. Table salt can probably be used nearly as well as the chemically pure sodium chloride.

"The toxicity of the diluted solution seems to be somewhat decreased by these additions, except in the case of C. P. sodium chloride."

Diseases, an important factor in the transit and storage of potatoes, G. K. K. Link (*Potato Assoc. Amer. Proc., 11 (1924), pp. 60–66*).—This general subject is dealt with under the heads of nature and types of transit and storage diseases of potatoes, nature and extent of the resulting losses, and responsibility for these losses.

Methods to be observed to prevent spread of virus diseases in potatoes grown for seed stock, D. Folsom and E. S. Schultz (*Potato Assoc. Amer. Proc., 11 (1924), pp. 20–26*).—Since the methods to be used to prevent spread of virus diseases in potatoes grown for seed stock depend largely upon the region, variety, and disease in each case, it is thought desirable and even necessary that the potato degeneration problem be studied in detail in each potato-growing region.

[Sugar cane yield factors in Louisiana] (*Facts About Sugar, 18 (1924), Nos. 19, pp. 442, 443; 20, p. 466; 21, pp. 490, 491; 22, pp. 514–516; 26, pp. 610, 611*).—In the series of five articles noted below, sugar-cane disease, notably mosaic, constitutes a significant factor.

The problem of sugar cane yields in Louisiana, W. E. Cross (pp. 442, 443).—As bearing upon the problem of sugar cane yields in Louisiana, the author offers suggestions from experience in Argentina, dealing briefly with mosaic as a factor in decreasing productivity, and as constituting the main problem

of the industry at the present time. It is claimed, however, that this problem has largely been solved in Argentina by the adoption of Java canes P. O. J. 36 and 213 as the basic canes. Others are discussed as to merits. Several Tucuman seedlings appear thus far to be immune.

Factors limiting sugar yields in Louisiana, W. C. Stubbs (p. 466).—Conditions important to maximum yields, as discussed, involve, in addition to favorable climatic conditions, suitable drainage, cultivation, and control of disease, including, recently, mosaic.

Practical means of raising Louisiana yields, S. F. Morse (pp. 490, 491).—Naming, as fundamental requirements, correct cultural methods and maintenance of soil fertility, the author notes the effects of disease, including mosaic.

Must feed cane crops to produce higher yields, D. N. Barrow (pp. 514-516).—The author emphasizes the prevalent depletion of soil resources and elements needed in commercial fertilizers.

Mosaic's rôle in limiting Louisiana yields, E. W. Brandes (pp. 610, 611).—Discussion is given chiefly of mosaic as related to yield, including investigations seeking immune or resistant cane varieties to meet the mosaic situation as existing in Louisiana.

The problem of sugar cane yields in Louisiana, II, W. E. Cross (*Facts About Sugar, 19 (1924), No. 8, pp. 181, 184, 185*).—Replying to comments in or upon the articles above noted, the author presents data, with discussion, bearing on views offered.

Gum diseases of sugar cane in the Philippines, H. A. Lee (*Phytopathology, 13 (1923), No. 11, p. 504*).—The author has established the identity of the red vascular disease of sugar cane in the Philippines with the bacterial cane wilt of Java.

Sugar cane mosaic and sugar cane chlorosis, F. S. Earle (*Facts About Sugar, 19 (1924), No. 16, p. 372*).—This is an attempt to enable even inexpert observers to distinguish with certainty between sugar cane mosaic and chlorosis. The latter appears to be rather widely distributed, the author having noted it in many localities in Cuba, though usually as scattered isolated cases.

"The whole success of mosaic eradication depends on numerous and quickly repeated roguings. During showery weather, when the disease is always spreading fastest, fields should be gone over as frequently as once a week until no more cases are found."

The search for the cause of mosaic, M. T. Cook (*Facts About Sugar, 19 (1924), No. 24, pp. 570, 571*).—An account is given of mosaic, covering very briefly its history, theories as to its causation, and means of control. It is recognized that in the absence of more efficient and economical control methods, sugar cane mosaic may fairly well be held in check by employment of resistant varieties, seed plats, and roguing.

Mosaic-resistant Java canes in Tucuman, W. E. Cross (*Facts About Sugar, 19 (1924), No. 11, pp. 250, 251*).—Methods of cultivation, milling, and yields are discussed in connection with the disease situation. This has culminated in the replacement, largely, of canes formerly used with Java canes, several varieties of which are discussed as to qualities.

Taxonomy of the Sclerotinia on Helianthus annuus, E. S. Jones (*Phytopathology, 13 (1923), No. 11, pp. 496-500, fig. 1*).—As a result of a study of the disease of sunflowers attributed by many authors to *S. libertiana* and by Lawrence to *S. perplexa* (E. S. R., 28, p. 346), the author concludes that the disease of sunflowers of Europe caused by *S. libertiana* is identical with that which has been encountered frequently in America.

A disease of tomato caused by Phytophthora mexicana, sp. nov., J. W. Hotson and L. Hartge (*Phytopathology, 13 (1923), No. 12, pp. 520-531, pls. 2,*

fig. 1).—A description is given of *P. mexicana* n. sp. isolated from tomatoes received in Seattle, Wash., from Mexico. The organism studied did not seem to be identical with any of the known species of Phytophthora, hence the name proposed.

Apple spraying and dusting experiments, 1918 to 1924, W. J. Morse and D. Folsom (*Maine Sta. Bul. 325* (*1925*), *pp. 125-184, figs. 3*).—In continuation of a previous report on experiments conducted to 1917 for the control of apple scab (E. S. R., 39, p. 651), the authors give the results of additional experiments during 1918 to 1924.

Tests made in 1918, a rainy season, with three applications of lime sulfur gave better scab control than with lead arsenate alone. A combination schedule of lime sulfur for one application and lead arsenate alone for the others gave the highest percentage of smooth fruit. In 1919, a rather rainy season with scab appearing unusually early, the disease was not controlled by three applications of 2-2-50 Bordeaux mixture or of lime sulfur with lead arsenate, although it was controlled better by these than by lime sulfur alone. In 1921 three applications of lime-sulfur spray controlled scab. In 1922 four applications of lime sulfur with lead arsenate did not control scab, although the treatment produced better results than four applications of dust or three applications of spray. Dry lime sulfur was as effective as the liquid against scab, and it caused less russeting. Similar results were obtained with three kinds of dusts, sulfur lead arsenate, copper lead arsenate, and copper calcium arsenate. Spray guns were more effective than rods for the application of the fungicide. In 1923 five applications of lime sulfur, with lead arsenate in two of them, controlled scab well, proving better than dust. The kind of lime sulfur, whether dry or liquid, and the use of a spreader or of a copper sulfate dormant spray gave negligible results. In 1924 ascospores were mature and were being discharged as early as the time for the prepink application, and some infection of the leaves had occurred at this time. The authors report that at least two other periods of infection and incubation occurred in the check plats before August 15. The various infections were checked by the fungicides used.

According to the report, scab on the fruit was controlled by four or five applications of lime-sulfur spray and by five applications of sulfur-lead arsenate dust. The amount of scab in any plat the preceding season was found to have no effect. The use of a casein spreader increased leaf burning caused by lime sulfur, and it was not needed for good control. Spraying caused more fruit dropping and russeting than was caused by dusting.

A record of 14 years on the Highmoor Farm with Ben Davis apple trees shows May 19 as the average date for the pink application and June 4 as the average date for the calyx application. During this period the average percentage of scab in the check plats was 50 per cent as compared with 8 per cent in plats where the disease was controlled by means of lime-sulfur spraying. A spraying schedule involving three applications which was effective from 1911 to 1916 failed in several subsequent years. As a result of these experiments lime sulfur was found to be the best general means for controlling apple scab, and usually the dry form was as effective as the liquid when used strong enough.

The authors claim that apple scab appears to be less injurious in Maine than in other apple-growing regions. From a review of reports on scab control elsewhere it is indicated that the time of the first infection of the spores and the consequent value of a prepink application are exceedingly variable, that dusting is more often disappointing than spraying with the same number of applications, and that the value of a casein spreader is easily overestimated.

Treatment of apple canker diseases (*Missouri Sta. Bul. 236 (1926), p. 59*).—In continuation of studies of various substances for covering pruning wounds and blister canker infections of apple trees (E. S. R., 53, p. 447), H. G. Swartwout reports that Tanglefoot has been the most effective of the materials used in keeping the wounds thoroughly covered, but that no material or treatment has been found which will stop the development of blister canker in infected trees. The disease reappeared after two years in practically all canker infections treated.

Storage scald of apples, D. B. Carrick and J. Oskamp (*N. Y. Agr. Col. (Cornell) Ext. Bul. 128 (1925), pp. 10, fig. 1*).—The use of oiled wrappers or shredded oiled paper is said to have markedly reduced the storage scald, as compared with that of untreated fruit. When used in equal amounts by weight, the shredded oiled paper is said to have given as good scald control as did the oiled wrappers. Smaller amounts of shredded oiled paper were not always so satisfactory. In the storage of fruits the relation of proper maturity and prompt storage at low temperature must be considered in connection with fruit scald.

Crown-gall studies of resistant stocks for Prunus, C. O. Smith (*Jour. Agr. Research [U. S.], 31 (1925), No. 10, pp. 957–971, pls. 3*).—Previous investigations of the author having shown that the nursery stocks in general use for stone fruits in California are susceptible to crown gall (E. S. R., 28, p. 447), tests were made of a number of species and varieties of Prunus and Amygdalus to ascertain their susceptibility to infection.

Forty different species, some of which included a number of varieties, were tested by making artificial inoculations with the crown gall organism, and differences in susceptibility among the species and often among the varieties of the same species were observed. This was especially true among the varieties of *P. domestica*, some of which showed strong resistance. The wild species, *P. pumila*, *P. besseyi*, *P. mume*, *P. umbellata*, and *P. alleghaniensis*, as a whole appeared to be strongly resistant.

Species of Amygdalus showed a high percentage of infection when the inoculations were made with small fragments of galls at the time of planting the pits. *A. mira*, the smooth-pit peach of China, showed a very satisfactory resistance, and *A. tangutica* and *A. persica potanini* are considered promising in this respect.

Seven years of experimental inoculation with *P. mume* demonstrated its high resistance, and preliminary inoculation tests on seedlings of *P. umbellata* indicated considerable variation as regards susceptibility to crown gall infection. The Italian prune and other varieties of *P. domestica* showed resistance and the author believes that seedlings of them should be grown to test resistance inheritance.

A test was made by treating peach roots with Bordeaux mixture and other chemicals before planting them in infested soil, but the author states that no practical method for using germicides in treating germinating pits or roots of the peach can be recommended as yet.

Coryneum blight of stone fruits in Washington, C. S. Parker (*Abs. in Phytopathology, 13 (1923), No. 11, p. 510*).—By means of artificial inoculations and reisolations *C. beyerinckii* is said to infect peach, apricot, and cherry. Infection was found to take place only through the stomata or ruptured epidermal tissue of leaves.

Diseases of brambles in Illinois and their control, A. S. Colby and H. W. Anderson (*Illinois Sta. Circ. 305 (1926), pp. 3–20, pl. 1, figs. 3*).—The authors describe anthracnose, cane blight, crown gall, leaf spot, orange rust, spur blight, leaf curl, raspberry mosaic, and bramble streak. In addition to sug-

gesting specific methods of control, the planting of healthy and vigorous stock and the practice of sanitary methods of field culture are recommended.

Preliminary report on rots of the cranberry in Pacific County, D. J. CROWLEY (*Abs. in Phytopathology, 13 (1923), No. 11, pp. 509, 510*).—The author reports very little rot of cranberries in the bogs during the growing season in Pacific County, Wash., but after the berries were placed in storage they showed the following organisms which are responsible for rots: *Fusicoccum putrefaciens, Guignardia vaccinii, Pestalozzia guepinii vaccinii, Sporonema oxycocci, S. pulvinatum, Anthostomella destruens, Phomopsis* sp., *Stemphylium* sp., and *Botrytis* sp. Storage of berries at 32° F. is said to reduce the storage losses by about one-half.

Notes on the failure of grapevines to set fruit and on shelling, A. S. RHOADS (*Phytopathology, 13 (1923), No. 12, pp. 513–519, pl. 1*).—After discussing the effect of rain, cold, and other factors on the nonsetting of grapes, the author shows that shelling of grapes may be caused by various fungus diseases, such as downy mildew, bitter rot, white rot, ripe rot, etc.

A promising remedy for black measles of the vine, L. O. BONNET (*California Sta. Circ. 303 (1926), pp. 10, figs 5*).—A description is given of black measles, a vine disease said to be widely distributed in the grape-growing districts of California. The leaves, canes, and fruit are subject to attack, and the disease is said to derive its name from the spotted appearance of the grapes at the time of ripening. The cause of the disease is as yet unknown, but in many of its symptoms it is said to resemble apoplexy of the vine, a disease reported from Europe and northern Africa.

Preliminary experiments indicate that black measles may be controlled by spraying or washing infected or suspected vines with an arsenical solution, such as sodium arsenite, 3-50. Where sodium arsenite is not available, white arsenic and washing soda or white arsenic and soda lye can be substituted.

Citrus scab in Japan, T. TANAKA (*Phytopathology, 13 (1923), No. 11, pp. 492–495*).—A brief historical account is given of the occurrence of citrus scab in Japan. This disease is said to be distributed all over Japan, but the severity of infection is not equal in all places. It is also widely distributed in Formosa.

Relation of soil conditions and orchard management to the rosette of pecan trees, J. J. SKINNER and J. B. DEMAREE (*U. S. Dept. Agr. Bul. 1378 (1926), pp. 16, pls. 8*).—In a previous publication (E. S. R., 40, p. 544) McMurran showed that rosette in pecan trees was greatly reduced by heavy applications of manure. The authors of the present publication give the results of field studies on the effect of soil treatments and laboratory investigations of soil from infected and noninfected orchards.

Experiments conducted in two badly rosetted orchards on soils low in organic matter and fertility are reported, in which one orchard was given thorough cultivation and two crops of green manure plowed under each year, while in the second the vegetation was cut and removed and none of it turned under. The former treatment resulted in an increased supply of organic matter and nitrogen in the soil, which caused a gradual improvement and finally the apparently complete disappearance of rosette symptoms, while the second cultural treatment resulted in a decrease of organic matter and of nitrogen in the soil and a marked increase in rosette symptoms. The authors claim that there is a close correlation in orchard soils having a high nitrogen and organic-matter content with healthy productive trees and of soils having a low nitrogen and organic-matter content with unfruitful rosetted trees.

Leaf cast of Larix occidentalis by Hypodermella laricis in north Idaho, H. SCHMITZ (*Phytopathology, 13 (1923), No. 11, pp. 505, 506, fig. 1*).—A leaf cast

of larch is described, which is said to be an important disease of western larch through the killing of the needles and short spurs carrying the needles by *H. laricis*.

Longevity of the teliospores and accompanying uredospores of Cronartium ribicola Fischer in 1923, P. SPAULDING and A. RATHBUN-GRAVATT (*Jour. Agr. Research [U. S.], 31 (1925), No. 10, pp. 901–916, fig. 1*).—During the summer of 1923 the authors tested telia from eight species of Ribes, and under outdoor conditions their longevity varied from 19 days for one collection of *R. rotundifolium* to 87 days for *R. nigrum*. The floating method of germination was found to be much superior to the damp-chamber method of testing. Precooling did not stimulate germination of the teliospores to any considerable degree. The authors found that the period of germination of teliospores increased with their age, whether kept indoors or outdoors exposed to the weather.

Uredospores accompanying the teliospores remained viable for a maximum period of 59 days under the conditions of the experiments.

ECONOMIC ZOOLOGY—ENTOMOLOGY

The life of the bat, C. DEKENNES, trans. by L. C. WILCOX (*London: Thornton Butterworth, 1925, pp. 153, fig. 1*).—A popular account.

Observations on the birds of Argentina, Paraguay, Uruguay, and Chile, A. WETMORE (*U. S. Natl. Mus. Bul. 133 (1926), pp. IV+448, pls. 20*).—In the introductory part of this work the author gives an itinerary of the travel performed while making his observations of birds that migrate, a sketch of tentative life zones of the region traversed, and notes on migration. The main part of the work consists of an annotated list of the species of birds collected, with observations on a few of which no specimens were taken (pp. 22–434).

Studies on the biology of the oyster (Ostrea edulis) in the Limfjord, with special reference to the influence of temperature on the sex change, R. SPÄRCK (*Danish Biol. Sta. Rpt., 30 (1924), pp. 3–84, figs. 22*).—This report includes a summary of the literature on generation and breeding habits of the oyster (pp. 7–12), reports of investigations on the function of the generative organ of the oyster (pp. 12–45), the influence of surrounding conditions on the pelagic larvae (pp. 45–49), fluctuations in the stock of oysters in the Limfjord (pp. 50–61); geographical distribution of the oyster (pp. 61–68), theoretical importance of the alternate hermaphroditism (pp. 69–72), and other observations (pp. 72–79).

The biological relationships of Leishmania and certain herpetomonads, E. H. WAGENER and D. A. KOCH (*Calif. Univ. Pubs., Zool., 28 (1926), No. 20, pp. 365–388, pls. 4*).—The subject is dealt with under the headings of comparison of morphology (pp. 366–368), immunological reactions with antiserums (pp. 368–372), skin reactions in sensitized animals (373–376), and attempted experimental infection of mice (pp. 377–379). A list of 26 references to the literature cited is included.

Applied entomology: An introductory text-book of insects in their relations to man, H. T. FERNALD (*New York and London: McGraw-Hill Book Co., 1926, 2. ed., [rev.], pp. XIV+395, figs. 388*).—In this second edition (E. S. R., 46, p. 152) the chapter on the Hymenoptera has been considerably rearranged, and a chapter has been added dealing with injurious animals more or less related to insects with which the entomologist is expected to cope.

An entomological survey of the Salt Fork of the Vermilion River in 1921, with a bibliography of aquatic insects, C. P. ALEXANDER (*Ill. Nat.*

Hist. Survey Bul., 15 (1925), Art. 8, pp. 435–535).—Following the report of the survey, the author presents a 76-page bibliography of aquatic insects.

Entomology [at the Missouri Station], L. HASEMAN ET AL. (*Missouri Sta. Bul. 236 (1926), pp. 50–52*).—In reporting upon a study of the life cycle of the codling moth and the best time and method of applying insecticides for controlling it, tables are presented showing analyses of calyx cups and tips after spraying at different pressures during the years 1924 and 1925. Brief notes are also appended on the Hessian fly, malarial mosquito, and insects attacking nursery stock and melon and related crops.

Report of economic entomologist, L. J. NEWMAN (*West. Aust. Dept. Agr. Ann. Rpt. 1925, pp. 22–24*).—A brief statement of the occurrence of and work with the more important insects in Western Australia during the year ended June 30, 1925.

Report of work done in the entomological section for 1923–24 (*Mysore Dept. Agr. Rpt. 1923–24, pt. 2, pp. 10–12*).—A brief account is given of a few of the important insects of Mysore during the year under report.

Tentative keys to the orders and families of Indian insects, T. B. FLETCHER (*Agr. Research Inst., Pusa, Bul. 162 (1925), pp. II+101, pls. 9*).—Keys are given for the separation of orders and families of insects occurring in India.

Fumigation of citrus trees in Florida, J. R. WATSON (*Fla. Grower, 33 (1926), No. 9, pp. 9, 22, figs. 3*).—In this discussion it is pointed out that, while the cost of fumigation is greater than that of spraying, the increased efficiency resulting from this method of application may make it desirable.

A study of the disinfection of vegetable and food products [trans. title], P. MARCHAL and P. VAYSSIÈRE (*Min. Agr. [France], Ann. Épiphyties, 11 (1925), No. 3, pp. 121–183, pls. 10, figs. 14*).—In the first part of this paper (pp. 123–155) the authors deal with methods of disinfection, in the second part (pp. 155–173) with the stations established for the disinfection of agricultural products, and in the third part (pp. 174–179) with the disinfection of mills. A bibliography of four pages is included.

The use of vacuum for insect control, E. A. BACK and R. T. COTTON (*Jour. Agr. Research [U. S.], 31 (1925), No. 11, pp. 1035–1041*).—The authors here report upon bell jar and vault experiments. It was found that a vacuum of 28 to 29 in. maintained for 7 hours in a bell jar of 825 cu. in. capacity, when the temperature ranged from 60 to 70° F. and the barometer read 29.3 in., killed all adults of 16 of the common household and stored-products pests. It killed all pupae and larvae of the black carpet beetle, all larvae of the hide beetle, 70 per cent of the larvae of the Mediterranean flour moth, and 80 per cent of the larvae of the Indian-meal moth. Larvae of the dark meal worm, *Tineola biselliella*, the case-bearing clothes moth, and *Trogoderma tarsale* were apparently not affected. Exposure for 24 hours to this vacuum killed all adults, pupae, and larvae except 50 per cent of the larvae of *T. tarsale*. Eggs of none of the species were to be had except *T. biselliella*, and of these only 10 per cent were killed.

A vacuum of 26 to 29 in. maintained for 4 days in a bell jar, with the temperature ranging from 60 to 70° and the barometer from 29.3 to 29.7 in., killed all adults of 18 pests, all larvae of 15 of the 18, and all eggs of *T. biselliella*, which were the only eggs available for experimental purposes. Exposure of 2 days to this vacuum killed all forms included in the experiments except 80 per cent of the larvae of *T. tarsale* and 60 per cent of the eggs of *T. biselliella*. Exposure for only 1 day killed a large proportion of the forms included, all except 50 per cent of the adults of the cadelle; 50 per

cent of the larvae of *Anthrenus fasciatus*, the black carpet beetle, and *T. bisselliella;* 40 per cent of the larvae of the case-bearing clothes moth; 80 per cent of the larvae of the cadelle; none of *T. tarsale;* and only 10 per cent of the eggs of *T. bisselliella*.

A vacuum of 24 to 28 in. maintained in a concrete vault 8 by 8 by 8 ft., when the temperature varied between 60 and 70° and the barometer readings were between 29.3 and 29.7 in., gave results which indicate that the usual fabric pests troublesome in storage warehouses can be killed by the vacuum treatment.

Dengue: Its history, epidemiology, mechanism of transmission, etiology, clinical manifestations, immunity, and prevention, J. F. Siler, M. W. Hall, and A. P. Hitchens (*Philippine Jour. Sci., 29 (1926), No. 1-2, pp. 304, pls. 9, figs. 19*).—In the course of this discussion of dengue the authors deal with its transmission by the mosquito, pointing out that dengue and yellow fever are transmitted by the same species, *Aedes aegypti* L., and that the mechanism of transmission for both diseases is strikingly similar. Epidemics of both dengue and yellow fever are, therefore, subject to the same control measures.

"The mechanism of transmission briefly is as follows: The dengue patient infects mosquitoes during the first 3 days of illness; the infected mosquito is able to transmit the virus 11 days after its infection; infected mosquitoes remain infective throughout life; hereditary transmission of the virus does not occur."

An annotated list of the Thysanoptera known from India and Ceylon, T. V. Ramakrishna Aiyar (*Jour. Bombay Nat. Hist. Soc., 30 (1925), No. 4, pp. 861-871*).—Records here presented include species representing 47 genera from the region up to 1924.

The biology of a common Chinese waterstrider (Heteroptera, Gerridae), W. E. Hoffmann (*Lingnaam Agr. Rev., 3 (1925), No. 1, pp. 48-63*).—This is an account of a species which feeds extensively upon emerging insects, such as mosquitoes, midges, mayflies, damsel flies, and aquatic Diptera.

***Coptosoma ostensum* Dist. and its enemy *Synia melanaria* Muls.,** T. V. Subramanyam (*Jour. Bombay Nat. Hist. Soc., 30 (1925), No. 4, pp. 924, 925, pl. 1*).—A brief account of the small pentatomid bug *C. ostensum*, which for three years has bred on one particular palas tree (*Butea frondosa*) in the arboretum of the Agricultural College, Coimbatore, avoiding other near-by trees of the same species. The lady-bird beetle *S. melanaria* is predacious upon the numphs.

Preliminary observations on an insect of the cotton stainer group new to the United States, T. C. Barber (*Jour. Agr. Research [U. S.], 31 (1925), No. 12, pp. 1137-1147, figs. 2*).—This is a report of studies of *Dysdercus obscuratus* Dist., a cotton stainer not hitherto recorded from the United States, which was found during 1924 in a number of cotton fields in the lower Rio Grande Valley of Texas, as well as in cotton fields in Tamaulipas, Mexico, on the opposite side of the Rio Grande. While this species has not as yet been observed to cause any injury of note, it is closely related to species that have long been recognized as very serious cotton pests in different parts of the world, and it may prove to be of economic importance. The account relates particularly to its life history and habits and includes technical decriptions of its several stages.

The padi fly (Leptocorisa spp.) in Kuala Pilah district, W. H. Barnes and F. W. South (*Malayan Agr. Jour., 13 (1925), No. 11, pp. 351-355*).—Following an account of the history of this pest in the Kuala Pilah district of Negri

Sembilan in 1924 and 1925, the author deals with control measures employed and the results obtained.

The maize jassid (Balclutha mbila Naude.), C. P. VAN DER MERWE (*Union So. Africa Dept. Agr. Jour., 12 (1926), No. 1, pp. 75–77*).—A brief account of this pest on the Natal coast, where it is thought to transmit the mosaic disease.

Notes on Egyptian Coccidae with descriptions of new species, W. J. HALL (*Egypt Min. Agr., Tech. and Sci. Serv. Bul. 64 (1925), pp. V+31, pls. 6*).—This paper is a continuation of the studies of Egyptian Coccidae previously noted (E. S. R., 53, pp. 53, 653). Nine species new to Egypt are recorded, seven of which are new to science. Two species recorded by other workers but not previously collected by the author have been found and are also included. Additional information on species recorded in earlier bulletins is given in part 2, and the list of host plants for Egyptian Coccidae is brought up to date in part 3.

The butterflies of Ceylon, W. ORMISTON (*Colombo: H. W. Cave & Co., 1924, pp. XI+143+[20], pls. 8*).—Two hundred and thirty-three forms are recognized as occurring in Ceylon. Two appendixes are included listing (1) butterflies the larvae of which are believed to feed on cultivated plants, and (2) food plants of the larvae of all Ceylon butterflies so far as known at present.

The paddy swarming caterpillar, J. C. HUTSON (*Ceylon Dept. Agr. Leaflet 32 (1925), pp. 3, figs. 10*).—A brief summary of information on this pest.

Important Opuntia insects of the United States: Biological notes on the moth-borers (Pyralidae), J. C. HAMLIN (*Pan-Pacific Ent., 2 (1925), No. 1, pp. 1–11*).—This paper deals with the more destructive representatives of that group of Opuntia insects attacking the joints internally.

How the European corn borer lives and does its damage, T. H. PARKS (*Ohio Agr. Col. Ext. Leaflet 2 (1926), pp. 4*).—A brief popular account.

The European corn borer in the Old World and Canada, T. H. PARKS (*Ohio Agr. Col. Ext. Leaflet 3 (1926), pp. 4, fig. 1*).—This is a practical account.

The corn borer menace in Ohio, H. OSBORN (*Ohio Agr. Col. Ext. Leaflet 1 (1926), pp. 4, fig. 1*).—This is a brief summary of information calling attention to the importance of this pest.

European corn borer control and qnarantine regulations (*Penn. Dept. Agr. Bul. 414 (1925), pp. 8, figs. 3*).—A brief popular account.

A new corn and boll worm from Peru (Lepidoptera, Pyralidae), H. G. DYAR (*Insecutor Inscitiae Menstruus, 13 (1925), No. 10–12, pp. 219, 220*).—Under the name *Jocarula agriperda* n. g. and sp., the author describes a new lepidopteran, the larvae of which were reared from the tips of ears of corn and also from cotton bolls, which they usually enter at the tip, and end by boring into the seeds. Through their attacks bolls were altered and developed prematurely. Their attack on cotton was observed in the valleys of Cagnete and Lima.

Comments on the distribution of the European pine-shoot moth, C. HEINRICH (*Jour. Wash. Acad. Sci., 16 (1926), No. 4, p. 104*).—An investigation of the present status of *Rhyacionia buoliana* Schiff. in northeastern States, by the author, has shown it to be about what it was in 1914 except that on Long Island a greater area is infested, the species having appeared in many new localities on a number of private estates. He also found it at Tarrytown, N. Y., and at Newport and Somerville, N. J., but in several other places where it had been found in 1914 it was no longer present. The author points out that this moth has been able to survive local conditions and to thrive in this country for about 13 or 14 years, and that it is so well distributed on Long Island that until eradicated that locality will remain a source of infestation for

other places. The pest is also well established, though not so widespread, in Newport and vicinity, and it has been distributed from nurseries to various private estates in New York, Connecticut, Rhode Island, New Jersey, and probably in other localities further west. In places where the clean-up has been thorough, as at points in Massachusetts and at Great Neck, L. I., the insect has completely disappeared. It has apparently not escaped into any of our forests or into large plantings or standing growths of native pines.

The tea tortrix, J. C. HUTSON (*Ceylon Dept. Agr. Leaflet 33 (1925), pp. 2, figs. 9*).—A brief account of this pest.

Revision of the North American moths of the subfamilies Laspeyresiinae and Olethreutinae, C. HEINRICH (*U. S. Natl. Mus. Bul. 132 (1926), pp. V+216, pls. 76, figs. 2*).—This is a continuation of the author's revisionary work on the family Olethreutidae (E. S. R., 49, p. 254). Thirty-five genera, 223 species, and 9 varieties are recognized as belonging to the two subfamilies here treated. Of these, 16 genera, 34 species, and 3 varieties are described as new.

The blueberry tip worm (Contarinia vaccinii Felt), a new species of midge attacking cultivated blueberries, B. F. DRIGGERS (*Jour. N. Y. Ent. Soc., 34 (1926), No. 1, pp. 82–85*).—This is a brief account of an insect enemy of the blueberry first observed during a severe infestation of a nursery bed near New Lisbon, N. J., in the summer of 1921. A second outbreak occurred in 1925 at Whitesbog, N. J., where injured tips were found on plants in the nursery beds and greenhouse on July 5.

The injury is caused by the larvae feeding on the immature leaves of the partly opened buds. The feeding on the two outside leaves of the bud is confined to the inner side of those two leaves, but the larvae continue feeding on the inside of the bud and eventually kill the young bud. The injured leaves first turn yellow and, later, red spots appear on the outside of the exposed leaves. After the larvae descend to the ground, the dead tip dries out and becomes blackened and brittle. Practically 100 per cent infestation was found on plants in the greenhouse at Whitesbog from the first of July to the latter part of September.

A description of the egg, larva, and pupa, by the author, and of both sexes of the adult, by E. P. Felt, under the name *C. vaccinii* n. sp., is included.

Contribution to a monograph of the American Syrphidae from north of Mexico, C. H. CURRAN (*Kans. Univ. Sci. Bul., 15 (1924), No. 1, pp. 5–216, pls. 12*).—The author describes 107 forms, in connection with tables for the separation of the genera and species. This is followed by notes on the biology and ecology of the Syrphidae (pp. 164-170). In an appendix 10 species are described as new, and notes are presented on 8 additional forms. A bibliography of three pages and an index are included.

Fly control by means of the fly-larval-trap manure enclosure, E. BABER (*Jour. Roy. Army Med. Corps, 45 (1925), No. 6, pp. 443–452, figs. 4*).—The author describes a simple and inexpensive device for storing manure and fermenting waste matters in such a manner as to trap all fly larvæ migrating therefrom.

Host relations of Compsilura concinnata Meigen, an important tachinid parasite of the gipsy moth and the brown-tail moth, R. T. WEBBER and J. V. SCHAFFNER, JR. (*U. S. Dept. Agr. Bul. 1363 (1926), pp. 32*).—This is a report of studies of a tachinid that was introduced from Europe into Massachusetts in 1906 and found in 1909 to be generally distributed over considerable territory. The data here presented supplement the accounts of Howard and Fiske in 1911 (E. S. R., 25, p. 662), Culver in 1919 (E. S. R., 41, p. 461), and Tothill in 1922 (E. S. R., 49, p. 555). The bulletin deals with the sources of collections and data, care of collections and methods of rearing, life history and hibernat-

ing hosts, status of hibernating hosts, generations, status of summer hosts, records of rearings other than those recorded at the Gipsy Moth Laboratory, and the effect upon native parasites and upon host species.

The control of fruit fly, W. B. GURNEY (*Agr. Gaz. N. S. Wales, 36 (1925), No. 12, pp. 879–887, figs. 6*).—This is an account of the methods which may be used in the control of fruit fly.

Agromyzid fly in beans, A. S. CAMPBELL (*Lingnaam Agr. Rev., 3 (1925), No. 1, pp. 16, 17*).—This is an account of injury to the roots and stems of beans by *Agromyza phaseoli* Coql., at Canton, China. An account of this insect in Australia, by Froggatt, has been noted (E. S. R., 25, p. 261).

Notes on the behavior of Cotinis nitida L. and its bird enemies, F. H. CHITTENDEN (*Biol. Soc. Wash. Proc., 39 (1926), pp. 15–17*).—In addition to notes on the habits of the green June beetle, the author records observations of attacks upon it by the starling and the cardinal.

The coffee borer, K. KUNHIKANNAN (*Mysore Agr. Calendar, 1926, pp. 16–20, figs. 3*).—This is a discussion of control measures applicable on infested estates.

Weevil in wheat and storage of grain in bags, D. C. WINTERBOTTOM (*Adelaide: Govt., pp. 122, pls. 13, figs. 12*).—This is a record of experiences in Australia during the years 1915 to 1919.

The banana weevil borer (Cosmopilites sordidus Chev.), J. L. FROGGATT (*Queensland Agr. Jour., 24 (1925), No. 6, pp. 558–593, figs. 15*).—This is a somewhat extended account of the banana root borer, dealing particularly with its life history, bionomics, natural enemies, and remedial measures.

Dusting controls the boll weevil, J. O. PEPPER (*Clemson Agr. Col. S. C., Ext. Circ. 76 (1926), pp. 20*).—The results of experiment station dusting work with the boll weevil are reviewed, followed by the reports of farmers with whom demonstrations were carried on. Control measures are briefly summarized.

The rôle of bumblebees in the pollination of certain cultivated plants, O. E. PLATH (*Amer. Nat., 59 (1925), No. 664, pp. 441–451, figs. 3*).—This paper deals with bumblebees and the fertility of red clover, experiments with the hardy garden larkspur, and bumblebees and the tomato crop. The author shows that the bumblebee is an important factor in the fertilization of red clover in most if not all parts of the world. The hardy garden larkspur (*Delphinium cultorum* Voss) is dependent upon insects for pollination, and, in the vicinity of Boston is pollinated largely, if not exclusively, by bumblebees. While the tomato crop does not depend upon pollination by bumblebees, it is probable that the yield is slightly increased if the plants are cross-pollinated.

Alcohol-formalin treatment of infected combs, J. C. HUTZELMAN (*Bee World, 7 (1926), No. 8, pp. 120, 121*).—A brief account of this treatment for foulbrood.

The peach sawfly, its biology and control [trans. title], A. PAILLOT (*Min. Agr. [France], Ann. Épiphyties, 10 (1924), Nos. 3, pp. 147–213, figs. 59; 4, pp. 215–237, pls. 8*).—This is a report of a study of the morphology and biology of (*Tenthredo, Lyda*) *Neurotoma nemoralis* (L.) (pp. 150–177), its natural enemies (pp. 178–213), and artificial methods of control (pp. 215–235).

Another gall that secretes honeydew, L. H. WELD (*Bul. Brooklyn Ent. Soc., 20 (1925), No. 4, pp. 175–179*).—This is a brief report from the U. S. D. A. Bureau of Entomology on galls received from Shasta County, Calif., with the statement that they secrete honeydew in such quantities in the fall that bees store up from 30 to 40 lbs. of honey per hive from this source. The galls seem to be those of *Disholcaspis eldoradensis* Beut. and are produced on twigs of *Quercus lobata* Nee, known locally as the river bottom oak.

Sulphur-impregnated clothing to protect against chiggers, H. E. Ewing (*Jour. Econ. Ent., 18 (1925), No. 6, pp. 827–829, pl. 1*).—The author records almost perfect protection from the use of sulfur in powdered form in suspension in a strong soap solution.

The common box-turtle, a natural host for chiggers, H. E. Ewing (*Biol. Soc. Wash. Proc., 39 (1926), pp. 19, 20*).—The author records finding the common box turtle (*Terrapene carolina carolina* L.) to be a host of larvae of *Trombicula irritans* (Ril.), the common North American chigger.

The red legged earth mite, Penthaleus destructor (Jack.), L. J. Newman (*Jour. Dept. Agr. West. Aust., 2. ser., 2 (1925), No. 4, pp. 469–475, figs. 6*).—This is an account of a mite that is one of the worst winter pests in Western Australia. It infests nearly all vegetable and garden flowers and some field crops, and is particularly damaging to young seedlings and tender foliage.

The entomophytous fungi of the genus Beauveria Vuill.; a contribution to the study of B. effusa Vuill., a parasite of the Colorado potato beetle [trans. title], R. Dieuzeide (*Min. Agr. [France], Ann. Epiphyties, 11 (1925), No. 3, pp. 185–219, pl. 1, figs. 10*).—In this paper the author deals with the genus Beauveria and the species *B. densa* Pic., *B. bassiana* Vuill., *B. globulifera* Pic., and particularly *B. effusa* Vuill.

ANIMAL PRODUCTION

Net-energy values of alfalfa hay and alfalfa meal, E. B. Forbes, J. A. Fries, and W. W. Braman (*Jour. Agr. Research [U. S.], 31 (1925), No. 10, pp. 987–995*).—The digestibility and net energy values of alfalfa hay chopped in a silage cutter and of alfalfa meal were compared in a series of digestion and metabolism experiments with one steer at the Pennsylvania Institute of Animal Nutrition. The hay and meal were given alternately during six periods, and comparisons were made on three different planes of intake. Each feeding period lasted 21 days, the first 11 days of which were considered preliminary. The last 10 days were run as a digestion experiment, including 2 days in the respiration calorimeter for determining heat production and the products of respiration. The results of the experiments are tabulated in detail. They show that the alfalfa hay was slightly better digested than the meal, probably due to a suppression of rumination from the alfalfa meal, swallowed, at least in part, past the paunch. The difference was 2.2 per cent for the dry matter. The net energy values of the hay and meal were essentially the same.

The relation of diet to bodily activity and the capacity to withstand unfavorable circumstances, A. G. Hogan and H. M. Harshaw (*Missouri Sta. Bul. 236 (1926), pp. 35, 36*).—In continuing the study of the ability of female rats receiving synthetic rations to produce young (E. S. R., 53, p. 464), the recent results indicate that the vitamin B requirement for lactation is much greater than the amount required for maintenance. Many young have died during the nursing period, and additions of yeast tended to lower the mortality. Studies on the existence of the vitamin for reproduction have confirmed the results of Evans and Bishop.

Commercial feeding stuffs, 1924–1925, J. M. Bartlett (*Maine Sta. Off. Insp. 116 (1925), pp. 9–28*).—The usual report of the official inspection of feeding stuffs giving the guaranties and composition of the samples analyzed between July 1, 1924, and July 1, 1925 (E. S. R., 52, p. 268).

Revised net-energy values of feeding stuffs for cattle, E. B. Forbes and M. Kriss (*Jour. Agr. Research [U. S.], 31 (1925), No. 11, pp. 1083–1099*).—The net energy values of feeds for the maintenance and increase in weight of

steers as published from the Pennsylvania Institute of Animal Nutrition have been revised according to the findings in the recent studies of methods of computation, with special reference to those previously noted (E. S. R., 53, p. 271; 54, p. 463). The data for making the revisions are tabulated, and the net energy values and percentage utilization of the metabolizable energy are given for each feed or feed combination so far studied.

Normal growth of range cattle, A. B. Clawson (*U. S. Dept. Agr. Bul. 1394 (1926), pp. 12, figs. 4*).—Data are reported showing the individual weights of 108 steers taken at weekly intervals during the nine summers of 1916 to 1924. The animals were kept under normal range conditions at the Salina (Utah) Experiment Station. An average gain of 255.1 lbs. per head was made for all the seasons. Yearlings, 2-year-olds, and 3-year-olds made approximately the same total seasonal gains, but on the basis of the percentage of live weight increase the younger cattle were superior.

[Experiments with beef cattle at the Missouri Station] (*Missouri Sta. Bul. 236 (1926), pp. 33–35, 36, 37, figs. 2*).—The results of two experiments are briefly reported, the first of which has been continued for several years (E. S. R., 53, p. 466).

Factors influencing the normal rate of growth in domestic animals and the permanency of the effects of arrested development, A. G. Hogan.—One steer severely underfed for practically all of his life was still growing slightly at 9 years of age. In body measurements he was nearly as large as some of the other animals that had not been subjected to such severe underfeeding. These results indicated that weight alone was no index of growth in such animals. The underfed animals were generally able to fatten quite rapidly when placed on sufficient rations.

Feeding grain to beef calves while following their dams, E. A. Trowbridge and M. G. Clark.—An account is given of the results of feeding a lot of fall calves and another lot of spring calves supplemental grain rations when on blue grass pasture. Average daily gains of 1.87 and 1.90 lbs. were produced by these lots during the feeding period from May 13 to December 1.

[Steer feeding experiments at the Worland, Wyo., State Farm] (*Wyoming Sta. Rpt. 1925, p. 92*).—Barley was only 84 per cent as valuable as corn for producing gains in steers. Molasses did not produce sufficient extra gain to warrant its use. Corn silage produced smaller but more profitable gains than the grains, but wet beet pulp and alfalfa were found to yield the largest profits per head.

Methods of wintering pregnant ewes and fattening their lambs for early market, M. T. Foster (*Missouri Sta. Bul. 236 (1926), p. 36*).—There were required 2.16 lbs. of grain to produce 1 lb. of gain by lambs fed in a creep for 52 days while nursing their dams. The grain ration consisted of corn, oats, bran, and linseed oil meal 2 : 2 : 1 : 1. Hay was also available.

[Lamb feeding experiments at the Worland, Wyo., State Farm] (*Wyoming Sta. Rpt. 1925, p. 92*).—Lambs receiving rations of corn and alfalfa made average daily gains of 0.32 lb., whereas others gained 0.30 lb. when the corn was replaced by barley. Supplementing these rations with molasses produced sufficient extra gains to offset the extra feed cost. Corn silage and alfalfa produced slower gains and smaller profits. Wet beet pulp produced gains of 0.30 lb. daily and returned the largest estimated profit of all rations.

Investigation of the uniformity of wool fibers of Württemberg improved native sheep, with a contribution to the technique of measuring the fineness of wool [trans. title], R. Mansfeld (*Ztschr. Tierzüchtung u. Züchtungsbiol., 4 (1925), No. 1–2, pp. 157–180, figs. 6*).—This consists of a statistical study of the effect of sex, pregnancy, care, season, and other factors on the fineness

of the wool fiber. Comparative methods of measuring the diameter of the fibers are also discussed.

Influence of field-pea rations on the quality of pork, J. E. NORDBY and R. S. SNYDER (*Jour. Agr. Research* [*U. S.*], *31* (*1925*), *No. 12*, *pp. 1173–1178*).—The results are reported of tests conducted at the Idaho Experiment Station of the value of field peas when fed in dry lot or hogged down for swine feeding.

In one experiment 4 lots of 8 Duroc-Jersey shotes, averaging 120 lbs., were fed for 76 days in dry lot on the following rations: Lot 1 cracked peas only, lot 2 cracked peas and barley 3:7, lot 3 rolled barley and tankage 15:1, and lot 4 cracked corn and tankage 9:1. The average daily gains and feed required per 100 lbs. of gain by the respective lots were as follows: 1.36 and 378.4 lbs., 1.41 and 410.9 lbs., 1.31 and 438.3 lbs., and 1.41 and 409.5 lbs.

In another experiment lots of Poland-China and Duroc-Jersey shotes, averaging 98.5 lbs. in weight were used for a 30-day test of forage crops. One lot of 11 pigs hogged off 0.85 acre of peas. Another lot of 13 hogged off 0.95 acre of peas, with a 1 per cent ration of rolled barley. Two other lots of 11 pigs each were full fed on alfalfa, the one with a ration of rolled barley and tankage 15:1 and the other with cracked corn and tankage 12:1. The pigs made average daily gains in the respective lots of 0.96, 1.07, 1.17, and 1.30 lbs. The pigs on pea forage receiving the supplemental feeding consumed 101.2 lbs. of barley per 100 lbs. of gain. Of the lots on alfalfa pasture those receiving the barley ration consumed 400.3 lbs. of concentrates per 100 lbs. of gain, while those on the corn ration consumed 360.8 lbs. of grain in making an equal gain.

At the end of the 30-day period on forage these pigs were finished on similar feeds in dry lot, cracked peas replacing the pea forage, the proportions in the lot receiving barley being 7:2. The rolled barley-tankage and corn-tankage mixtures were modified to 14:1 and 10:1, respectively. The average daily gains and feed required per 100 lbs. of gain were, respectively, as follows: Peas alone 1.49 and 362.2 lbs., peas and barley 1.64 and 393.4 lbs., barley and tankage 2.02 and 411.3 lbs., and corn and tankage 2.01 and 414.7 lbs.

At the end of the two dry lot feeding periods, the pigs were slaughtered and dressing percentages, shrinkage of the bellies during the curing process, and melting points and iodine number for the back and leaf fat were determined. The dressing percentage for the pigs fed on peas alone were 77.03 and 74.00 in the two experiments, which were somewhat lower than the dressing percentages in the other lots, which were as follows: Peas and barley (3:7) 80.46 and (7:2) 74.2, barley and tankage (15:1) 78.57 and (14:1) 79.1, and corn and tankage (9:1) 81.13 and (10:1) 78.5. It is noted that the hogs receiving peas tended to grow but not fatten. The slight differences in the shrinkage of the bellies from the different lots during the sweet-pickle cure used in one experiment and the dry-salt cure used in the other, as well as during smoking, did not appear to be sufficiently significant to be attributed to the method of feeding. Similar conclusions were drawn from the data on the melting points and iodine values. The type of feeding could not be determined by a physical examination of the carcasses, although the pea-fed pigs showed slightly more variability in the finish, due to some individuals not taking readily to peas.

[Experiments with swine at the Missouri Station] (*Missouri Sta. Bul. 236* (*1926*), *pp. 39–43*, *figs. 4*).—The results of the hog-feeding experiments (E. S. R., 53, p. 468) are briefly reported.

Forage crops for swine, L. A. Weaver.—Three lots of pigs averaging approximately 54 lbs. in live weight were fed the same grain mixture of corn

9 parts, shorts 2 parts, and tankage 1 part on sweet clover pasture for 42 days followed by 77 days on alfalfa. The grain was self-fed to one lot and hand-fed to the other two, but one of these received all the pigs would eat, while the other was given three-fourths of a full feed. The self-fed pigs made an average daily gain per head of 1.65 lbs. as compared with 1.60 lbs. by the lot full fed by hand and 1.27 lbs. by the hand-fed lot receiving the limited grain ration. The amount of feed required per unit of gain varied in direct proportion to the rate of gain. In another experiment the comparative values of mixtures of corn and tankage 10:1 and 20:1 for feeding pigs on alfalfa pasture were determined. The two lots of pigs averaged 65 lbs. per head in live weight at the start of the experiment and were hand-fed for 98 days. The ration of corn and tankage 10:1 produced slightly larger gains, but since the feed required per pound of gain was practically the same in both lots the mixture containing the smaller proportion of tankage was more economical.

Fecundity of swine: The effect of age, the normal oestrous cycle, and the cycle as influenced by unfavorable dietary conditions, F. B. Mumford, A. G. Hogan, and F. F. McKenzie.—A progress report of this experiment states that the sixteenth generation of the continued early breeding of gilts has been produced and also the fifth generation in the breeding work with gilts on the high, low, and medium planes of nutrition. Previous conclusions have mainly been corroborated.

In studies of the oestrous cycle in swine 11 young but sexually mature sows have been killed at various intervals following oestrum, and histological studies of the genital organs made. Characteristic changes during the cycle have been observed in the condition and secretions from the vulva; changes in the cellular contents of smears from the vagina and vestibule; alternating thickening and sloughing of the epithelium of the vestibule, vagina, and uterus; and changes in number and size of the follicles in the ovary. Ovulation has been found to occur some 24 hours or more after the first signs of heat.

In further studies of fecundity, gilts were started on calcium-deficient rations at from 3 to 4 months and from 8 to 9 months of age, and a number were killed at different stages of the oestrous cycle, but three were allowed to produce pigs. The young, however, died shortly after birth. Similar gilts on normal rations raised their pigs to 8 weeks, as well as, in one case, two pigs from one of the sows receiving the calcium-deficient ration. Insufficient milk secretion by the sows receiving the low calcium ration appeared to be the immediate cause of the death of the young.

Hog experiments [at the Wyoming Station] (*Wyoming Sta. Rpt. 1925, pp. 77, 78, 91*).—Farrowing late in April and early in May has proved more successful than March farrowing, but otherwise swine practices are similar to those found successful at lower altitudes. In a pasture experiment it was found that from 11 to 18 per cent more hull barley than corn was required to produce a unit of gain. When 1.5 lbs. of grain were fed per pig daily, the comparative value of the pastures ranked in the following order: Alfalfa, rape, and a mixture of oats and peas. The pigs used in these experiments were further employed in tests of the comparative values of Wyoming-grown small grain for fattening purposes, and ground rye produced more rapid and more economical gains than shelled corn, hull barley, or bald barley. Corn and bald barley produced higher dressing percentages, and these feeds as well as rye produced hard fat in the carcass, but hull barley produced oily fat.

In continuing the study of the comparative feeding value of Wyoming-grown and eastern-grown corn at the Torrington State Farm (E. S. R., 53, p. 668), Wyoming corn again proved to be fully equal to the eastern corn. The following average daily gains were made with the different rations: Wyoming white corn grown on irrigated land fed with tankage and alfalfa 1.64 lbs., Wyoming yellow corn grown on irrigated land fed with tankage and alfalfa 2.06 lbs., Wyoming yellow corn grown on dry land fed with alfalfa and tankage 1.98 lbs., Wyoming yellow corn fed with alfalfa 1.15 lbs., and eastern yellow corn fed with alfalfa and tankage 1.89 lbs.

Growing draft colts, E. A. Trowbridge and D. W. Chittenden (*Missouri Sta. Bul. 236 (1926), pp. 37, 38, fig. 1*).—In continuing this study (E. S. R., 53, p. 470), data are given for the two lots of yearling colts receiving the full-fed and half-fed grain rations. The full-fed lot made average daily gains on pasture of 1.43 lbs. and during their yearling winter period 0.89 lb., as compared, respectively, with 1.26 and 0.25 lbs. made by the lot receiving half as much grain.

[Poultry experiments at the Missouri Station] (*Missouri Sta. Bul. 236 (1926), pp. 64–67*).—These experiments have been continued from the previous year (E. S. R., 53, p. 471).

Rate of growth of chicks under normal conditions, M. A. Seaton.—A table gives the average weights of males and females taken at weekly intervals from hatching to approximately 1 year of age for Rhode Island Reds, Buff Rocks, White Rocks, Barred Rocks, Rhode Island Whites, Anconas, and White Leghorns.

Value of sour milk, beef scrap, cottonseed meal, gluten meal, and oil meal in rations for egg production, H. L. Kempster.—The egg production of lots of yearling hens receiving a basal mash of bran shorts and corn meal plus 30 per cent of cottonseed meal or soy bean meal, with or without 4 per cent of minerals, was compared with the egg production of other lots in which the protein supplement to the mash consisted of 20 per cent of tankage, meat scrap, or fish meal or 30 per cent of dried buttermilk. A table shows the feed consumption, average egg production, and feed required per pound of eggs for each of the eight lots. The group receiving dried buttermilk produced the largest number of eggs, averaging 128.5. The other lots receiving animal protein produced averages of 107 to 110.6 eggs per bird. The groups receiving cottonseed meal and soy bean meal plus minerals produced 116.9 and 121 eggs, respectively, but the lots receiving the vegetable protein supplements without minerals produced only 67.4 and 69.9 eggs per bird during the year.

Time of hatching in relation to egg production, H. L. Kempster.—Data on 1,100 White Leghorn hens taken during the period of seven years have indicated that from the standpoint of winter egg and annual egg production during the first year birds hatched between April 1 and 15 were most satisfactory. Birds hatched during February and March produced more eggs during the summer, and there was little disadvantage for such early hatched birds during the entire year.

Relation of time laying starts to future production, H. L. Kempster.—An analysis of the relation between the time of first laying and the total yearling production in the records of 1,100 White Leghorn hens indicated that those which started laying about November 1 produced the largest number of eggs during the winter and during the entire year. Within the groups studied approximately 27 per cent started laying before November 1, and 22.5 per cent did not start until after January 1.

[Experiments with poultry at the Sidney Experimental Station], E. M. STRAIGHT (*Canada Expt. Farms, Sidney (B. C.) Sta. Rpt. Supt. 1923, pp. 38–43*).—The results of the following experiments are briefly reported:

Comparison of various systems of incubation.—In a comparison of the results of incubation with hens and with an artificial brooder, it was found that 84 per cent of the fertile eggs were hatched by hens as compared with 60.7 per cent of the fertile eggs set in an artificial incubator. It was calculated that 2.2 eggs were required per chick alive at the end of three weeks which was hatched by hens as compared with 2.3 eggs for each chick alive at the end of three weeks hatched in an artificial incubator. Two years' averages showed similar results.

Breeding for fertility, hatchability, and livability.—In a comparison of the hatching results from the eggs of hens and pullets, it was found that 85 per cent of the hens' eggs and 50 per cent of the pullets' eggs were fertile, of which 64 and 56 per cent, respectively, hatched. It required 2.1 hens' eggs to produce a live chick at three weeks of age as compared with 6.4 pullets' eggs. A study of the hatching results from eggs set in February, March, and April showed the fertility in these months to be 78, 84, and 78 per cent, respectively, but only 36 per cent of the fertile eggs set in February hatched while 66 and 64 per cent of those set in March and April produced live chicks.

Fish meal v. *beef scrap.*—In comparing fish meal and beef scrap as protein supplements for egg production, one lot of 10 birds laid 1,777 eggs when receiving beef scrap, while another laid 1,615 eggs with the fish meal supplement. The feed cost of 1 doz. eggs was calculated at 14 cts. on the fish meal ration as compared with 14.4 cts. on the beef scrap ration.

Hastening maturity of late pullets.—The 1922 and 1923 results of experiments in which an effort was made to hasten the maturity of pullets are reported. Crate feeding was compared with the feeding of dry mash during the first year. The average winter record for the birds fed dry mash was 39.5 eggs as compared with 35.6 eggs for the crate-fed birds. During the second year dry mash feeding, wet mash feeding, and crate feeding were compared. The birds fed the dry mash had an average winter production of 29 eggs and an average yearly production of 175 eggs, while similar data for crate feeding were 24.3 and 168 eggs, and for wet mash feeding 14 and 125 eggs.

Confinement v. *range for egg production.*—The results of a comparison of the egg production of birds kept confined and allowed on the range indicated practically no difference during the past year.

Best hatching date for egg production.—The average egg production of pullets hatched in March, April, and May was 184, 166, and 192 eggs, respectively. Similar results were obtained when the averages of two years were combined.

Confinement v. *range in breeding.*—The hatching results with confined birds and birds allowed range were compared. The eggs laid by the confined birds were 70 per cent fertile and 37 per cent of the eggs hatched. The eggs laid by the birds on range were 61 per cent fertile and 33 per cent hatched.

[Feeding experiments with poultry at the Kentville Experimental Station], W. S. BLAIR (*Canada Expt. Farms, Kentville (N. S.) Sta. Rpt. Supt. 1923, pp. 67–70*).—The results of the following feeding experiments with poultry are briefly reported:

Home mixed v. commercial scratch grains.—In a comparison of a home-mixed scratch grain consisting of wheat, whole corn, and oats, 7.5 : 7.5 : 5, with a commercial grain (Purina) consisting chiefly of wheat, corn, and oats, with

some millet, buckwheat, kafir, and sunflowers, it was found that 35 birds receiving the commercial scratch feed laid 2,518 eggs as compared with 2,193 eggs by the lot receiving the home-mixed scratch feed. A moistened mash was fed to both lots.

Fish meal v. beef scrap.—Two lots of 25 White Leghorn pullets were selected for comparing beef scrap with fish scrap, each containing 60 per cent of protein, as protein supplements for egg production. The birds received equal amounts of scratch grain and mash. The lot receiving fish meal laid 1,816 eggs as compared with 1,755 eggs laid by the lot receiving beef scrap.

Oyster shell v. clam shell.—In testing the comparative value of oyster shells and clam shells as calcium supplements for egg production, two lots of 25 White Leghorn pullets were selected and fed equal amounts of scratch grain, mash, beef scrap, and fish scrap. The lot receiving oyster shells produced 1,720 eggs as compared with 1,820 eggs by the lot receiving clam shells.

Mangels, clover, and sprouted oats as green feed.—Three lots of 25 White Leghorn pullets were used for comparing the value of mangels, clover, and sprouted oats as green feeds for egg production. The lot receiving mangels in addition to the basal scratch and mash rations fed to all lots produced 1,068 eggs as compared with 1,146 eggs by the clover lot and 886 eggs by the lot receiving sprouted oats.

Cost of feeding chicks for the first two months.—The amounts of feed consumed by chicks up to 2 months of age were recorded. The experiment was started with 140 chicks, but 15 died during the first month and 4 during the second month. The total feed consumption for these chicks was 51 lbs. of Blatchford's Milk Mash, 50 lbs. of Purina chick scratch grain, 20 lbs. of stale bread, 2 lbs. of meat meal, and some skim milk. During the second month, 72.5 lbs. of Purina scratch grain, 36 lbs. of cracked corn, 36 lbs. of wheat, 82 lbs. of Blatchford's Milk Mash, 30 lbs. of corn meal and bran, 20 lbs. of bread, 4 lbs. of meat scrap, and some skim milk were consumed.

[Experimental work with poultry at the Rosthern Experimental Station], W. A. MUNRO (*Canada Expt. Farms, Rosthern (Sask.) Sta. Rpt. Supt. 1924, pp. 46–49*).—The results of the following experiments with poultry, conducted during 1924, are briefly noted:

Monthly hatching results.—The results of eggs incubated during February, March, April, and May indicate that the fertility of the eggs was 83 per cent during April and May as compared with 68 per cent for February and March. The earlier hatched chicks, however, proved more desirable.

Hens v. pullets for breeding.—The hatching results with pullets' and hens' eggs showed practically no difference. Seventy-nine per cent of the hens' eggs and 78.9 per cent of the pullets' eggs were fertile, while 39.8 per cent of the fertile hens' eggs hatched as compared with 37.3 per cent of the pullets' eggs.

Milk v. beef scrap for egg production.—Two pens of 15 hens each were selected for comparing the value of skim milk fed ad libitum and 15 per cent beef scraps as supplementals to a basal mash. The results showed that the pen receiving skim milk produced 228 eggs at a calculated feed cost of 36 cts. per dozen, while the pen receiving beef scrap produced 264 eggs at a calculated cost of 39 cts. per dozen.

Preparing chickens for market.—Three lots of 36 birds were selected for camparing range fattening, crate fattening, and pen fattening of cockerels. The fattening period lasted 20 days, during which the average gains made per bird were 10.5, 25, and 13 oz., respectively. All of the birds in these experiments received a mash composed of equal parts of ground oats, ground

barley, and shorts moistened with buttermilk, and in addition had water to drink.

Mashes for crate fattening.—Six mashes were compared for crate fattening cockerels, i. e., corn meal and shorts, oatmeal and barley meal, oatmeal and shorts, barley meal and shorts, oatmeal and feed flour, and barley meal and feed flour. All were mixed with buttermilk. The average gains per bird produced during a 20-day fattening period on the different rations were 15.7, 21.5, 15.8, 18, 14.6, and 14.5 oz., respectively. It is concluded that shorts and ground oats and barley are the more satisfactory feeds for crate fattening purposes.

Crate feeding pullets before laying season.—In testing the effect of 4 weeks of crate fattening of pullets prior to placing them in winter quarters, it was found that 10 birds crate fattened in such a way produced 65.3 eggs each during 6 months as compared with an average of 75.1 eggs by a similar lot of pullets allowed range while the others were being crate fattened.

The relative feeding value and cost of milk in egg production, A. L. Walker (*New Mexico Sta. Bul. 150 (1925), pp. 32, figs. 4*).—Two experiments to investigate the value of semisolid buttermilk for egg production have been conducted.

The first experiment lasted 12 months, with 4 pens of 32 Single Comb White Leghorn pullets each. All lots had access to alfalfa range. Two of the pens received rations of mash composed of 40 lbs. of bran, 40 lbs. of ground oats, 40 lbs. of ground corn, and 30 lbs. of tankage, and scratch feed consisting of cracked corn, wheat, and barley (2:1:1). One of these pens was lighted from 4.30 to 7 a. m. The other 2 pens received the same scratch feed, but semisolid buttermilk diluted with 6 parts of water was available at all times. One of these pens received no mash, and the tankage was not included in the mash of the other pen. In the second experiment, which lasted from December to May, 4 lots were similarly fed and a fifth lot was given the complete mash, including tankage, together with semisolid buttermilk. The feed consumption and egg production of each pen are tabulated by months for each experiment, as well as the calculated feed costs and value of the eggs.

The combined results of the 2 experiments (18 months) showed that the largest amount of feed per bird (147.86 lbs.) was consumed by the pen receiving semisolid buttermilk and mash without tankage. The production of this pen was 45.9 per cent. The pen receiving buttermilk and no mash consumed 99.83 lbs. of feed per bird and the production was 42.8 per cent. The calculated returns per bird made by these 2 pens in excess of feed cost were $2.51 and $3.14. The lighted pen consumed an average of 125.7 lbs. of feed per bird and the production was 49.35 per cent, as compared with 113.67 lbs. of feed and 44.05 per cent production for the pen similarly fed without lights. The calculated returns were $2.61 and $2.64 per bird, respectively. The pen receiving the complete mash and buttermilk consumed 39.8 lbs. of feed per bird during the 6-month period and produced eggs at the rate of 56.3 per cent. The calculated return per bird was $1.45.

The author concludes that hens fed a sufficient variety of grain with semisolid buttermilk will not lay the largest number of eggs but will produce them at a relatively low feed cost. Tankage appears to be more economical than semisolid buttermilk when fed as a portion of the mash.

Variability of seasonal scratch grain consumption observed in Leghorns, G. W. Hervey (*Poultry Sci., 4 (1925), No. 4, pp. 161–164, fig. 1*).—Data are presented, based on the records of approximately 3,000 White Leghorns during their pullet year in the first Bergen County and second Vineland egg laying

contests, which indicate that a maximum daily grain consumption of 15 lbs. per 100 birds was associated with the highest annual egg production. No such association was found between the grain consumption and egg production in the spring or summer-fall periods. The most common scratch grain consumption during the winter, spring, and summer-fall periods was, respectively, 12.0, 10.7, and 6.4 lbs.

Rate of maturing as an indication of future egg production and profitableness in Single Comb White Leghorn pullets in commercial flocks, M. W. Buster (*Poultry Sci., 3 (1924), No. 6, pp. 194–200*).—In cooperative tests between the California Extension Service and breeders during 1921 and 1922–23, commercial flocks of pullets at from 4.5 to 6 months of age were segregated into 2 or 3 groups, according to their rate of maturity, in July, 1921, and in September, 1922.

During the 5 months, August to December, 1921, the early maturing and late maturing birds produced an average of 48.5 and 24.4 eggs, respectively.

In the experiments conducted in 1922–23, 4 of the flocks were divided into groups of late and early maturing birds. During each month of the 10-month test period, more eggs were produced by the early maturing group. The average production per pullet for the early and late maturing groups for the entire period was 131.6 and 103.6, respectively. The mortality percentages were 14 and 20. During the same year 2 flocks were divided into 3 groups, according to maturity. The early maturing group produced an average of 141, the medium 114.2, and the late maturing group 90.9 eggs during the 10 months. Higher mortality also accompanied late maturity.

Records of the costs and returns indicated that the early maturing birds made a profit of $1.27 per hen, exclusive of labor. The profits from the medium and late groups were 69 and −14 cts. respectively.

Culling as breeders, layers, and culls from the flocks divided into 3 groups showed 34.8 per cent of the early maturing group were selected as breeders, 52.3 as layers, and 12.8 as culls, while only 4 per cent of the late maturing birds were selected as breeders, 55.7 per cent as layers, and 40.2 per cent as culls. The medium group was intermediate in these respects.

Better rations—more eggs, F. E. Mussehl (*Nebraska Sta. Circ. 33 (1925), pp. 3–9, figs. 2*).—The principles of feeding for egg production, including several suggested rations, are given.

Egg production, monthly costs, and receipts on New Jersey poultry farms: November, 1924—October, 1925, W. H. Allen (*New Jersey Stas. Hints to Poultrymen, 14 (1926), No. 4, pp. 4*).—These data are based on the survey of 30 New Jersey poultry farms, on each of which over 500 birds are kept, and are comparable to those noted (E. S. R., 52, p. 573). A summary of similar data for the last 5-year period is included.

Report of egg-laying contests for 1924 and 1925, M. Decker (*New Jersey Stas. Hints to Poultrymen, 14 (1925), No. 3, pp. 4*).—A brief report is given of the rate of production and feed required, together with lists of the leading pens, in the Bergen County egg-laying contest and the Vineland international egg-laying and breeding contest (E. S. R., 52, p. 476).

Good incubation practices, R. R. Hannas (*New Jersey Stas. Hints to Poultrymen, 14 (1926), No. 5, pp. 4*).—Popular directions for the artificial incubation of hen's eggs.

Physiological ontogeny: A, Chicken embryos, II, III, H. A. Murray, Jr. (*Jour. Gen. Physiol., 9 (1925), No. 1, pp. 1–48, figs. 16*).—The results of two studies in this series are reported from the Rockefeller Institute for Medical Researc

II. *Catabolism. Chemical changes in fertile eggs during incubation. Selection of standard conditions* (*pp. 1–38*).—The changes in the composition of fertile hens' eggs during incubation resulting from the physiological processes concerned with the development of the embryo have been investigated and the data analyzed statistically. The incubated eggs were selected for uniformity from White Leghorn hens 9 to 18 months of age. The temperature of incubation used was 39° C. (102.2° F.), with a maximum variation of ±0.4°.

As a result of a comparison of three methods of calculating the surface of the eggs with the actual measured surface, it was found that 5.07 times the two-thirds power of the weight gave the best measure of the surface. The loss of weight in eggs during incubation was found to depend on the surface area and shell thickness, but by careful selection the effects of these variables were minimized. The average losses of weight of the egg shells during incubation were calculated from the relation between the shell weight and total egg weight prior to incubation and on other eggs after 17, 18, and 19 days of incubation. At the respective stages the egg shell consisted of 9.81±0.11, 9.46±0.14, 9.46±0.09, and 9.36±0.12 per cent of the total original weight of the eggs. From this the loss of shell weight from an average egg was calculated at 0.324 gm. during the incubation period. It was also found from the seventeenth to twentieth days of incubation that an increase of 1.0 gm. in the weight of the embryo was associated with a loss of 0.01 gm. of shell substance, which presumably meant an increase of 0.01 gm. of total solids in the egg contents. The losses in weight of eggs were found to be constant from day to day throughout the incubation period and were practically the same for fertile and infertile eggs, with the possible exception of the last three or four days.. The various metabolic processes and conditions which might tend to influence the loss in this way are discussed.

The amount of weight which an egg loses during the incubation period was found to be markedly affected by the humidity of the incubator as well as by temperature, ventilation, and other conditions. The amount of water lost during a definite period was found to be expressed as a function of the humidity by the formula $7.5\ (100-h)\ t$, in which h is the percentage of humidity and t the time. Higher temperatures tended to augment the amount of evaporation.

The solids contents of unincubated eggs and of eggs after 16, 17, 18, and 19 days of incubation were determined, from which the losses occurring during the incubation period were calculated. The carbon dioxide production by individual eggs was determined throughout the period. Both the chemical analyses and the carbon dioxide production indicated that the loss of solids was mainly due to the oxidation of fat. Equations were calculated and given for expressing most of the chemical changes found to occur during the incubation period.

III. *Weight and growth rate as functions of age* (pp. 39–48).—In studying the weight and growth rate of chicken embryos as functions of age, fertile eggs were opened at from 5 to 19 days of incubation and the wet weights of the embryos determined as accurately as possible. The average weights with their probable errors and percentage increases at the different ages are tabulated. Curves of the average weights and their logarithms were plotted against age. The equation $W=0.668\ t^{3.6}$ was found to express the embryonic weight W at any age t. The percentage increase in weight was found to be inversely proportional to the incubation age, and the product of the two was a constant, 3.6.

DAIRY FARMING—DAIRYING

[Experiments with dairy cattle at the Missouri Station] (*Missouri Sta. Bul. 236 (1926), pp. 47, 48*).—The results of the following experiments are briefly given.

Minimum protein requirements for the growth of dairy heifers, A. C. Ragsdale and W. P. Hays.—Three bull calves were started at birth on a synthetic ration calculated to provide adequate energy, minerals, and vitamins with milk as the sole protein. One heifer was started at 4 months and another at 17 months on the same ration. These animals had averaged approximately 75 per cent normal growth in height and 72 per cent normal gain in weight after the males had received the ration for 6 months and the heifers for nearly 1 year.

Studies in milk secretion: (a) Time relations in milk secretion, (b) mechanisms regulating variations in the composition of milk, A. C. Ragsdale, S. Brody, C. W. Turner, and W. P. Hays.—In tests over a period of 258 days of the effect of temperature on the fat percentage of cow's milk it was found that there was an average increase of 0.079 per cent in fat content for each 10° that the temperature was lowered between 24.5 and 86.5° F. In other experiments in which the temperature was controlled there was an increase in the fat test at temperatures over 70°, but between 72.5 and 27.0° there was a total increase in fat percentage of 0.863.

Standards of growth for dairy cattle, S. Brody, A. C. Ragsdale, W. P. Hays, and E. C. Elting.—The surface areas of 97 dairy cattle have been measured by covering the entire surface with a revolving cylinder. Calculations showed that the surface area was equal to $1{,}470W^{0.56}$, in which W is the live weight. It was further found that both the rate of maturity and the weight at maturity were related to duration of life in dairy cattle.

[Experiments with dairy cattle at the Wyoming Station] (*Wyoming Sta. Rpt. 1925, pp. 78, 79*).—These two experiments have been continued (E. S. R., 53, p. 673).

Native hay v. alfalfa for milk production.—As this experiment has continued, more efficient combinations of native hay and concentrates have been developed and less cottonseed cake has been found necessary, thus lowering the feed cost of milk production. The value of alfalfa hay as compared with native hay was not found to be as high as in the former experiment.

Grain as a substitute for skim milk for dairy calves.—The older calves in this experiment apparently developed normally, without defects in size or form that could be attributed to the absence of milk from the ration.

Protein requirement of dairy cows, A. E. PERKINS (*Ohio Sta. Bul. 389 (1925), pp. 363–402, figs. 8*).—An account is given of the feed consumption, with special reference to its protein content, of two cows fed during one complete lactation period and of one cow fed during two lactation periods on the low protein rations on which digestibility studies were previously noted (E. S. R., 54, p. 570). The amount of protein supplied to the cows was considerably below that prescribed by the Haecker standard, but the digestible nutrients were in excess of that standard. During the progress of the experiment the cows maintained their live weight and appeared normal in milk production and reproduction. The various favorable conditions in the ration, such as variety, palatability, etc., which might tend to bring about such favorable results, are discussed, and the practical economy of the feeding of low protein rations according to these results is pointed out, provided that further investigations confirm the conclusions. In the discussion of the work, refer-

ence is made to the experiments of Buschmann et al. (E. S. R., 54, p. 471) and Hills et al. (E. S. R., 48, p. 173).

Ground kafir as a feed for dairy cows, H. W. Cave and J. B. Fitch (*Kansas Sta. Circ. 119 (1925), pp. 8*).—Experiments to compare the feeding value of ground kafir and ground corn were conducted in 1923, 1924, and 1925 similar to those with ground sorgo and corn (E. S. R., 53, p. 377). The experiments were conducted by the double reversal method, the feeding periods being 30 days in duration with the first 10 days considered as preliminary. There were 5 cows in the 1923 experiment and 7 in the 1924 and 1925 experiments. The ration fed in all cases consisted of alfalfa hay, sorgo silage, and a grain mixture of 4 parts of ground corn or ground kafir, 2 parts of wheat bran, and 1 part of linseed oil meal.

The combined results showed that the feed consumption on both rations was similar. The live weights remained uniform except for a slight difference of 7 lbs. per cow in favor of the kafir ration. The cows on the corn ration produced a little more milk and fat, from which it was calculated that kafir proved to be 97.6 per cent as efficient for milk production and 95.8 per cent as efficient for fat production as corn. The fat percentage averaged 0.06 per cent greater on the corn ration. Corn and kafir appeared to be equally palatable.

The maintenance requirement of dry cows, D. C. Cochrane, J. A. Fries, and W. W. Braman (*Jour. Agr. Research [U. S.], 31 (1925), No. 11, pp. 1055–1082*).—Data are presented which were obtained in calorimeter and digestion experiments with four dry Jersey cows at the Pennsylvania Institute of Animal Nutrition. According to the methods described in other papers (E. S. R., 52, p. 577; 54, p. 463), the energy required for maintenance for an average of 12 hours standing and 12 hours lying was calculated for three of the cows as 4.152, 5.420, and 5.566 therms per 1,000 lbs. live weight. The individual differences are mainly attributed to the differences in the temperament of the experimental subjects. The results on the fourth cow were somewhat erratic, probably due to the fact that she refused considerable feed during the experiment and due to an overfat condition in this animal in a second experiment. Small variations in the observed and calculated heat production were found, and explanations are suggested. A method for determining the approximate digestibility of a ration without separate collection of feces and urine is also given.

It is noted that the maintenance requirement of dairy cows falls under the 6 therms per 1,000 lbs. live weight as suggested by Armsby, and it is also within the range found at the institute for steers. The cows also gained energy when 6 therms of net energy were supplied in their rations per 1,000 lbs. live weight. The ration used in this experiment consisted of alfalfa hay and a grain mixture of wheat bran, ground oats, corn meal, and linseed oil meal, 3:3:3:1. The net energy value of this ration when consisting of 40 per cent of alfalfa hay and 60 per cent of the grain mixture was found to be 1.418 therms per kilogram of dry matter.

Raising calves on the minimum amount of milk, R. N. Davis and W. S. Cunningham (*Arizona Sta. Bul. 111 (1925), pp. 83–101, figs. 13*).—There are reported in this bulletin the results of experiments in which 43 calves were fed to 153 days of age by three different methods. One group received whole milk until 10 days of age, after which the milk was gradually replaced by a gruel made by stirring into 1 gal. of water 1 lb. of a home-mixed calf meal consisting of 2 parts of corn meal, 4 parts of wheat middlings, 2 parts of oat flour, 1 part of linseed oil meal, 0.5 part of blood meal, 0.2 part of ground bone meal, and 0.2 part of salt. The replacement of the milk by the gruel was com-

plete when the calves were 40 days of age. The second group was similarly fed, except that a commercial calf meal was used in place of the home-mixed calf meal. The third group was given a more liberal supply of milk, the full ration of whole milk being continued for the first 30 days. The milk was then gradually reduced one-half and replaced by home-mixed gruel until the calves were 60 days old, when the milk was gradually reduced to 1 qt. per day, this amount being given through the remainder of the 5 months' feeding period. All lots had access to alfalfa hay and a grain mixture of wheat bran, rolled barley, and linseed oil meal.

The amounts of whole milk, calf meal, alfalfa, and dry grain mixture for each individual are given, as well as weights at birth and at 5 months of age for each individual and averages for the calves of each breed and sex in each group. Group 3 made the largest daily gains, averaging 1.60 lbs. per head, but the cost of feed was much higher, due to the increased allowance of milk. Groups 1 and 2 made average daily gains of 1.32 and 1.27 lbs., respectively. The growth of calves in the two lots receiving the minimum allowance of milk compared quite favorably with Eckles' determinations of normal growth (E. S. R., 43, p. 876), but the calves receiving the larger amounts of milk were much heavier at 5 months.

The application of the results of this experiment to the raising of calves under practical conditions is pointed out.

Better cows from better sires, J. C. McDowell and J. B. Parker (*U. S. Dept. Agr., Dept. Circ. 368 (1926), pp. 15, figs. 5*).—An analysis of the comparative milk and fat production records of 2,182 daughters having dams with cow-testing association records is reported. A comparison is made between the dams' and daughters' records for the entire data and also after grouping according to purebreds and grades. It was shown in these groups that the daughters of dams with the lower production records excelled their dams' production, whereas the daughters of the higher-producing dams tended to fall below their dams' production. There was an indication that better sires were used in purebred than in grade herds, since the daughters of purebreds excelled their dams' records until the records averaged 394 lbs. of fat, whereas with grades this limit was 349 lbs. of fat. A study of the individual sires having five or more daughters showed much variability in their effect on milk production.

Proved sires seemed to be the practical solution of the problem of breeding for improved production. The records of at least five daughters of a bull should be compared with their dams' records in proving sires.

The testing of pure-bred cows in New South Wales, L. T. MacInnes (*N. S. Wales Dept. Agr., Farmers' Bul. 153 (1925), pp. 36*).—An account of the testing work with dairy cattle in New South Wales during the year July 1, 1923, to June 30, 1924 (E. S. R., 51, p. 677).

Contribution to the biology of lactic acid fermentation [trans. title], M. Schmidt (*Milchw. Forsch., 2 (1925), No. 6, pp. 432–449, figs. 5*).—The author has made studies of lactic acid production in milk at the Dairy Experiment Station, Magyar-Óvár, Hungary. The milk tested was taken from different depths in containers 65 cm. (26 in.) high after being held under aerobic and anaerobic conditions and at different temperatures.

The studies showed that the production of acid proceeded much more rapidly at the surface than in the deeper layers. *Streptococcus lactis* bacteria were 85 times more numerous in the upper part than at the bottom of the containers. The large numbers of bacteria at the top of the milk appeared to be associated with the presence of the fat. Further tests with whey substantiated this conclusion, as no difference in the rate of acidity develop-

ment was apparent in the different layers. Milk coagulation, however, tends to begin from below, especially in milk of a high bacterial content.

These results indicate the desirability of frequent agitation of standing milk or cream during ripening.

The purification of rennet by adsorption and a new method for determining the concentration of rennet [trans. title], H. Lüers and A. Diem (*Milchw. Forsch., 2 (1925), No. 6, pp. 405–431, figs. 4*).—The method for determining the rennet concentration consisted of making determinations of the viscosity of the milk at two-minute intervals after adding the rennet, the material being held in a water bath. Milk made by dissolving milk powder in water and raw and cooked milks were used in the different tests. The effect of changes in the temperature from 25 to 52° C. was determined and correction factors calculated. The effects of adding various chemicals and changing the pH of the milk were also investigated. It was found that the optimum H-ion concentration for curding was approximately 6.2.

In the studies on adsorption, fuller's earth and basic colloidal aluminum hydroxide were used. The combination acquired an amphoteric reaction. The elution of the enzyme was brought about by the use of alkali phosphates having a pH of 6.98. Tests showed that the rennet was concentrated by this method, so that it had from seven to eight times the activity of the best known preparations. Tests of the effect of concentration on the activity of pepsin indicated that the concentration of the latter product was greater than for the rennet, demonstrating that the two enzymes differ.

The interpretation of certain empirical standards in their application to Irish butter, G. Brownlee (*Roy. Dublin Soc. Sci. Proc., n. ser., 18 (1925), No. 5, pp. 49–58, figs. 4*).—Chemical tests of 112 samples of Irish butter showed that 81 per cent of those taken between October 26, 1923, and February 6, 1924, were below the Reichert-Wollny standard of 24. It is during the fall and winter season that the majority of the cows are nearing the end of their lactation periods. Tests of 15 samples of butter from the Clonakilty Agricultural School, where the cows were more liberally fed than is customary, were all above 24. It was also pointed out that the cows at this institution received palm nut meal as one-half of their concentrates, and that the oil of this meal has a high Reichert-Wollny number. It is concluded that the standard of 24 for the Reichert-Wollny test is unfair for Irish butter. Comparative determinations by the Polenske, Koettstorfer, Ave-Lallemant, and Zeiss Butyro-refractometer tests were no more satisfactory than the Reichert-Wollny test.

[Experiments with dairy products at the Missouri Station] (*Missouri Sta. Bul. 236 (1926), pp. 48–50*).—Brief results on studies of the effect of various processes in the manufacture of ice cream and the changes in milk during freezing are given.

The effect of each ingredient in the manufacture of ice cream, W. H. E. Reid.—The effect on viscosity, bacterial content, and quality produced by reemulsifying, reviscolizing, and rehomogenizing 30 ice cream mixes of standard fat and solids contents is reported. The results of these studies showed that the viscosity was increased by emulsification, viscolization, and homogenization, and that a further increase occurred when the mix was emulsified a second and third time, but viscolizing or homogenizing a second or third time decreased the viscosity. The bacterial content was increased with each successive processing. The body and texture of the resulting ice cream were improved by the repeated processing, and greater viscosity developed during

aging. The maximum dispersion of the butterfat into the serum seemed to be a more important factor than viscosity in determining high quality.

The deleterious effects of frozen milk [and cream] on the marketability of milk and cream, W. H. E. Reid.—In studying the effect of freezing on the intensification of flavors in cream various common off flavors were added to samples prior to freezing. The results of such tests indicated that the intensification of such flavors became less pronounced upon freezing as the butterfat content was increased. Thawing frozen milk to which undesirable flavors had been added tended to intensify such flavors more when thawed at lower temperatures than when thawed at higher temperatures. They were least pronounced when thawed at 90° F. Freezing at lower temperatures tended to reduce the cream line. This decrease amounted to 43 per cent in samples frozen at 0° for 5 hours, but was only 1 per cent in milk frozen at 30°. The lower temperature and long freezing periods tended to lower materially the desirability of the appearance of the cream line.

VETERINARY MEDICINE

Bailey's text-book of histology, [F. R.] Bailey, rev. by O. S. Strong and A. Elwyn (*New York: William Wood & Co., 1925, 7 ed., rev., pp. XX+939, pls. [2], figs. [583]*).—This is a revised and rewritten edition of the work previously noted (E. S. R., 24, p. 384).

Nuttall's death camas (Zygadenus nuttallii) as a poisonous plant, C. D. Marsh, A. B. Clawson, and G. C. Roe (*U. S. Dept. Agr. Bul. 1376 (1926), pp. 14, pls. 2, figs. 3*).—This is a report of experimental investigations of *Z. nuttallii*, hitherto unrecognized as a stock-poisoning plant. It appears to have caused considerable loss of cattle in parts of Oklahoma, and probably is the cause of many unexplained cases of sickness and death in the regions where it is found, including the States of Texas, Oklahoma, Kansas, and the western border of Arkansas. The symptoms are similar to those produced by other species of death camas, but it is even more poisonous than the western species which have been studied. There are no effective medicinal remedies, but losses may be lessened by keeping animals from the plant and giving proper attention to sick animals.

Lupine studies.—II, The silvery lupine, O. A. Beath (*Wyoming Sta. Bul. 144 (1925), pp. 16, figs. 8*).—This is a report of investigations, conducted in continuation of those previously noted (E. S. R., 43, p. 783), which include feeding tests and range studies along with more or less technical laboratory researches.

The toxic dosage of the silvery lupine has not yet been satisfactorily established. Preliminary feeding tests indicate that with corral-fed sheep the equivalent of 4.4 lbs. of fresh pods (seeds not included) per hundredweight of animal induced toxic effects, and approximately 3 lbs. of fresh seeds or equivalent per hundredweight of animal gave positive lupine symptoms. Range observations and studies show that many other lupines play an important part in sheep poisoning, among those suspected being *Lupinus leucophyllus* of the western part of the State, *L. laxiflorus*, quite widely distributed over Wyoming, and *L. ornatus* of the central and northern sections. It is known that when sheep are poisoned on the range fruits (pods with inclosed seeds) are eaten more or less exclusively in a comparatively short period. Based on the original water content, 4 lbs. of leaves per hundredweight of sheep failed to give the slightest suggestion of toxicity. It is the opinion of the author that the minimum dosage suggested by the preliminary feeding tests is in excess of that ordinarily eaten by sheep on the range.

The alkaloidal assays of the poisonous parts of the silvery lupine have not been satisfactory. Samples collected August 15, 1923, consisting largely of immature fruits, gave alkloidal contents ranging from 0.104 to 0.211 per cent.

The resistance of fowl to strychnine, W. J. R. Heinekamp (*Jour. Lab. and Clin. Med., 11 (1925), No. 3, pp. 209–214*).—The experiments here reported indicate that pigeons and chickens possess a relative immunity to strychnine only when the drug is given by mouth. The minimum lethal dose was found to depend on the contents of the crop, the rate of absorption being inversely proportional to the amount of food in the crop and directly proportional to its fluidity. Glucose, presumably by increasing the glycogen content of the liver, enables the animal to withstand a larger dose. While this is not understood, it is thought that it may be due directly to the glycogen or to its elaboration of a neutralizing agent.

[Report of the parasitology department of the Wyoming Station] (*Wyoming Sta. Rpt. 1925, pp. 83–86*).—Sheep tick eradication work with a small flock since the publication of Bulletin 105, previously noted (E. S. R., 32, p. 757), has indicated that the sheep ticks can be eradicated by the method therein described, namely, by two dippings 24 to 30 days apart, and that none will appear in a flock except through contact with sheep that carry them.

Reporting upon swamp fever in horses, the author states that the blood of a horse inoculated with the disease 10 years previous was virulent when tested in March, 1924, although the animal showed only one very mild fever reaction during the year. Another horse showed no reaction when inoculated with virulent blood, which indicates that at least this horse was resistent to, or tolerant of, the virus.

Attempts to infest lambs with the tapeworms *Moniezia expansa* and *Thysanosoma actinoides* by scattering them over the grass and in drinking water failed.

The development of Onchocerca volvulus in Simulium damnosum, D. B. Blacklock (*Ann. Trop. Med. and Parasitol., 20 (1926), No. 1, pp. 1–48, pls. 4, figs. 10*).—The author finds *O. volvulus* infection to be common in the Konno district of the Protectorate of Sierra Leone, British West Africa, the larvae of this parasite having been found in the skin of 45 per cent of the persons examined systematically. A definite relationship between the diseases of the skin or diseases of the eyes and the infection with *O. volvulus* as judged by the presence of larvae in the skin could not be established.

S. damnosum was found to be very prevalent in the hilly country, which is covered with bush and grass and has numerous streams and rivers. The lesion inflicted on the skin by this species in biting is such as would dislodge the larvae of *O. volvulus* in the skin. In 780 dissections of the gut of wild *S. damnosum* there was an infection of 2.6 per cent with larvae morphologically identical with those of *O. volvulus*, and in 1,320 dissections of the thorax there was a larval infection of over 1 per cent. By allowing wild flies to feed on restricted and heavily infected areas of the skin, the gut infection was raised to 80 per cent in one experiment and the thorax infection to nearly 82 per cent in another experiment. The developing forms of *O. volvulus* were found in the thorax after the infecting feed up to the seventh, eighth, and tenth days, after which no insect survived.

Effects of feeding animals with trichinous meat containing nonviable trichinae, B. Schwartz (*Jour. Agr. Research [U. S.], 31 (1925), No. 10, pp. 945–947*).—The author found rats, dogs, and cats to be tolerant of heavy doses of meat containing nonviable trichinae, exhibiting no ill effects as a result of repeated ingestion of such meat. It is pointed out that these observations

are in harmony with the generally accepted view that pork in which trichinae have been destroyed by cooking or by some other method known to devitalize trichinae will not produce any of the symptoms characteristic of trichinosis or other harmful effects.

Infectious abortion investigations [at the Missouri Station], J. W. CONNAWAY, H. G. NEWMAN, and A. UREN (*Missouri Sta. Bul. 236 (1926), pp. 85–87*).—In reporting upon studies on the infectiveness and virulence of afterbirths from cows carrying *B. abortus* (Bang) infection, attention is called to the fact that afterbirths expelled at the time of an abortion, or even at a full-time calving, contain *B. abortus*. While difficulty has been experienced in cultivating this organism and in infecting guinea pigs from afterbirths obtained from long-time persistent abortion reactors at normal calvings, the organism has been shown to be present in the udder in the late stages of lactation and in the colostral milk at the time of parturition. The experiments both of 1924–25 and previously indicate that in cows which are persistent reactors to the tests and carry permanent udder infection, but have become regular breeders, the uterine or placental infection becomes sparse, or its powers to infect and produce abortion are greatly mitigated. It is pointed out that infected cows that have aborted one or more times and have become regular breeders have aborted again.

Monthly tests of the experimental swine herd have shown that, notwithstanding the persistence of the infection in certain individual sows, the herd infection seemed to be dying out. This result was evidently not due to an acquired herd immunity arising from an increased resistance of the individuals in the herd, but rather to a diminished infectiveness and virulence of the strain of *B. abortus* organisms harbored by the persistent reactors. The records of swine abortion in the experimental herd show that some sows that are carriers conceived and farrowed average or even large litters of living, thrifty pigs, but a large number of these abortion infection carriers did not prove profitable because of their small litters and failure to rear a good percentage of a living farrow.

In investigations of the factors affecting the reliability of the serological tests for the Bang abortion disease, blood samples were sent to check up the methods and the results obtained to the Michigan, Wisconsin, Minnesota, Georgia, South Carolina, California, and Oregon stations. Three of the laboratories used both the agglutination and complement fixation methods in the checking tests, and the others used the agglutination test only. Six lots, totaling 124 blood samples, drawn from 119 cattle in herds where the clinical history of each animal was known or could be obtained, were mailed at different times between April 30 and June 18, 1925, and tested. The conclusions arrived at are that both the serological tests are exceedingly accurate and practical in the diagnosis of the disease. However, the blood samples should be in good condition at the time of testing.

Infectious abortion in cattle (eighth report).—Some economic phases of Bacterium abortus infection and other observations in dairy herds, G. C. WHITE, R. E. JOHNSON, L. F. RETTGER, and J. G. MCALPINE (*Connecticut Storrs Sta. Bul. 135 (1925), pp. 405–428*).—This eighth report (E. S. R., 58, p. 887) is based upon a compilation, by R. E. Wing, of data covering the years from 1914 to 1924. During this 11-year period the herd averaged 30 cows in milk per year and was constituted in the proportion of 16 abortion reactors and 14 nonreactors, totaling 176 and 151 cow years, respectively. The annual milk yield per cow was 6,663 lbs. for the nonreactors and 5,655 for the reactors, and as a consequence the nonreactors each returned above

feed cost $28.41 more annually in value of milk than the reactors, the milk being computed at 7.5 cts. per quart, or $3.51 per hundredweight. The estimated loss in product, therefore, for the 176 cow years was $5,000.16.

"Fifty-nine reacting cows sold during this time brought an average per cow of $35.26 less than the 37 nonreactors. This represents a total depreciation of $2,086.24 due to abortion infection. During the period there were 32 more calves lost in the reacting group than the nonreacting, representing a loss of $20.59 per calf and a total loss of $658.88. These three losses among the reactors, namely, income from product, cow depreciation, and calves, amounted to a total of $7,745.28 for the 11-year period, or $44.01 per year for each infected cow. Even allowing for different values in other herds, if considered from an economic basis alone it would seem that no one could afford to retain infected cows in the herd."

Thirteen cases of calving before the two-hundred-and-fifteenth gestation day produced 1,717 lbs. of milk per cow less than in periods following a normal calving. Fourteen cases aborting between the two-hundred-and-fifteenth and two-hundred-and-sixty-fifth day produced 1,051 lbs. less per cow. The average shrinkage of these 27 cases was about 1,361 lbs. of milk (16.6 per cent), which at $3.51 per 100 lbs. has a value of $47.77. The average yield of these cows during normal periods was 8,161 lbs. In the first normal calving period after an abortion the yield went back to normal.

"The nonreactors required 1.82 services to produce each conception, whereas the reacting cows required 2.09 services. But following an abortion the reacting cows required 2.64 services per conception, equivalent to only 37.9 conceptions for each 100 services. However, if the cases following an abortion be deducted from the entire reacting group the number of services per conception for the remainder is 1.97, not so much greater than that for the nonreactors. The *B. abortus* infection, therefore, does not influence conception greatly except directly following premature calving. Cows yielding less than 275 lbs. of fat required 1.85 services for each conception, while those yielding over 500 lbs. of fat required 2.06. Yield in a herd of this kind, with good but not extreme records, has influenced the promptness of conception to a noticeable, but not to a large extent."

Recent investigations on blackleg immunization, J. P. Scott (*Jour. Amer. Vet. Med. Assoc., 67 (1925), No. 5, pp. 623–631*).—Investigations conducted at the Kansas Experiment Station, here reported, indicated that there is no difference in the properties of blackleg filtrate and blackleg aggressin. A more detailed account of the studies has been noted (E. S. R., 53, p. 884).

Cattle disease resulting from eating damaged or spoiled sweet clover hay or silage, A. F. Schalk (*North Dakota Sta. Circ. 27 (1926), pp. 13, figs. 2*).—The author presents an account of infection caused by feeding upon damaged sweet clover hay or silage, including the symptoms of the disease, post-mortem findings, treatment, prevention, and control, based upon experimental studies conducted during the three years preceding by L. M. Roderick and himself.

That certain specimens of molded, spoiled, or damaged sweet clover hay and silage cause a definite hemorrhagic disease in cattle has been demonstrated. Not all specimens of spoiled or damaged sweet clover hay and silage cause the disease, however. It appears that the kind and degree of mold or spoilage, as determined by ordinary inspection, do not determine whether a specimen is or is not dangerous for cattle. The symptoms which the owner may possibly recognize are swellings under the skin and stiff, lame gait, but either or both of these may be entirely absent. The skin swellings may be mistaken for those of blackleg, but are more firm and do not give off a crackling sound

when the hand is passed over them. The most serious and constant feature of the disease is the decrease in or complete loss of the clotting power of the blood. Animals actually bleed to death, internally and from dehorning, castrating, and other surgical operations. If the animals have not bled beyond the physiological limits, most cases can be saved by injecting them with fresh, defibrinated blood from healthy cattle. Perhaps the best known method of prevention is to alternate the damaged sweet clover every 15 days with some other forage. All operations which result in bleeding should be withheld for at least 15 days after the animals have been taken off the spoiled sweet clover. A limited amount of experimentation indicates that the disease does not develop from green sweet clover pasture.

Accounts of this disease (E. S. R., 50, p. 878), by F. W. Schofield (E. S. R., 48, p. 777; 51, p. 383), and by L. H. Pammel (E. S. R., 49, p. 178) have been noted.

A study of colostrum with special reference to the effect of heat (pasteurization) on its physico-chemical, bacteriological, immunological, and nutritional changes, A. C. Ragsdale, S. Brody, and C. W. Weber (*Missouri Sta. Bul. 236 (1926), pp. 46, 47*).—In reporting briefly upon investigations of this subject, the authors first consider the normal mortality and well-being of calves. Of 236 calves allowed to nurse the mother, 6.77 per cent died within the first six months from various causes. Of the surviving 220 calves, 1.36 per cent died between the ages of six months and one year. Of 868 calves that were allowed to nurse the mother for the first three or four days and were then hand fed with the mixed whole milk of the herd, 5.57 per cent died within the first six months from various causes. The percentage of deaths among 187 calves was 6.41 under six months of age and 0.57 per cent between the ages of six months and one year.

Of 40 calves known not to have nursed their dams, which were fed their mothers' colostrum after pasteurization in a water bath at 140° F. for 30 minutes. 7.5 per cent died. Ten additional calves were fed on an egg-white-and-milk emulsion as a substitute for colostrum, making 29 in this experiment, and there was a mortality of 34.14 per cent. Of 28 calves, including 7 added during the year, which were known not to have nursed their dams and which were fed on the mixed whole milk (colostrum free), 46.4 per cent died. The mortality rate of the noncolostrum calves appears to have depended upon the virulence of the *Bacillus coli* present in the herd, and environment.

Analyses for determining the bactericidal titer of blood serum were made of 24 calves, the blood samples being obtained at birth and at 12- and 24-hour intervals for the first 5 days of life. The calves were divided into 4 groups, 10 calves receiving milk containing several cubic centimeters of anticoli bacteriophage filtrate, 5 receiving colostrum, 5 receiving an emulsion of egg white in milk, and 4 receiving raw whole milk (colostrum free). It was found that the bactericidal titer of the blood serum at birth was low, with a rapid rise with age which appeared to be independent of the feed or the time of feeding.

The blood serum of 5 calves exhibited the bacteriophage phenomenon after receiving colostrum. The bacteriophage was polyvalent, having a virulence against both a stock strain of *B. coli* and a virulent strain of *B. coli* isolated from a calf fed milk and which died of *B. coli* infection. The blood serum of this same growth in 5 calves did not exhibit a bacteriophage phenomenon before ingesting colostrum. Four calves fed milk as a substitute for colostrum failed to exhibit the bacteriophage phenomenon, and all died of *B. coli* infection.

It was found that fresh, raw colostrum has a bactericidal action against both an avirulent and a virulent strain of *B. coli*. Samples inoculated with less than 5,000 *B. coli* per cubic centimeter failed to show the presence of this organism after eight hours' incubation at 37° C. An emulsion of egg white in milk at a concentration above 20 per cent was inhibitory to the growth of an avirulent strain of *B. coli*, but was an ideal culture medium for the growth of a virulent strain of *B. coli*. Raw milk has a low bactericidal action against the growth of *B. coli*. The lytic action of anticoli bacteriophage was very low in milk. An emulsion of egg white in milk favored the lysis of *B. coli* by the bacteriophage. The optimum concentration of the egg white emulsion in milk appeared to be between 30 and 40 per cent.

A study of a disease of the bones and joints of swine, an osteo-arthropathy, H. C. H. KERNKAMP (*Minnesota Sta. Tech. Bul. 31 (1925), pp. 3–47, figs. 14*).—This is a report of studies of a disease of the bones and joints, an osteoarthropathy, of swine characterized by certain paretic-like symptoms, which has attracted much attention in recent years. Rickets and posterior paralysis are terms often applied to a condition showing symptoms of the disease, and it is a deficiency disease belonging to the trophic group. The author concludes that a lack of calcium is closely associated, or may be the limiting factor, in the rôle of causative agent. Swine fed rations which supplied calcium at a low level developed typical cases of bone and joint disease.

"Calcium carbonate (lime, slaked, dried, and then pulverized) when added to the ration at the rate of 2 per cent apparently supplied the deficiency. None of the pigs receiving it developed the disease. Stiffness, lameness, and later loss of function are characteristic symptoms of the disease. The stiffness and lameness may occur in but one, two, three, or in all four legs. The typical pathological changes occur principally in the long bones and in the articulations between them. The degree or extent of the morbid change may not be uniform in all the bones of the limbs or in any single bone. This also applies to the articulations. Thus it is imperative that all the diarthrodial joints of the limbs, beginning with the knee and hock and including those proximal to them, should be inspected when examining a patient or cadaver. . . . In some cases the lesion was quite typical of rickets, in others of osteomalacia, and in some of atrophy. There were others that showed changes suggestive of an admixture of rickets, osteomalacia, and atrophy."

Common diseases of poultry, B. F. KAUPP and R. S. DEARSTYNE (*N. C. Agr. Col. Ext. Circ. 154 (1925), pp. 12, figs. 7*).—This is a practical summary of information.

A simple and effective system of management for the control of bacillary white diarrhea, R. H. WAITE (*Maryland Sta. Bul. 274 (1925), pp. 20, figs. 17*).—The author describes a system of management which has been tested at the station poultry plant, and by which he has been led to believe that the disease can be prevented or controlled and even eliminated from a flock.

The first step consists in the prevention of the spread of infection during the first 48 hours after hatching, by darkening the nursery compartment of the incubator at the time of hatching and keeping it dark until the chicks are 48 hours or more of age, when they are removed to the brooder. The second step consists in the removal from the brooder and destruction during the first few weeks of every weak and unthrifty chick. The third step consists in the removal from the range flock of all young fowls that have escaped rigorous culling in the brooder stage. These can be disposed of as broilers if they are of suitable quality, but if not must be destroyed. A fourth step consists in the selection of the best layers for the breeding pen, which means the selection of

birds that have passed through at least a year or preferably two years of laying. It is pointed out that all of these four measures are a part of good general management in itself.

An eye nematode in chickens, L. Hoh (*Lingnaam Agr. Rev., 3 (1925), No. 1, pp. 14, 15*).—This is a brief account of a nematode, probably *Filaria mansoni*, which causes considerable loss in China. An application of cresol solution at a little stronger than 2 per cent strength, for four days, resulted in signs of improvement, and within a week the diseased chickens had completely recovered.

AGRICULTURAL ENGINEERING

Agricultural engineering [studies at the Missouri Station], J. C. Wooley et al. (*Missouri Sta. Bul. 236 (1926), pp. 28–33, fig. 1*).—The progress results of studies at the station are reported (E. S. R., 53, p. 482).

In studies by Wooley and M. M. Jones of methods for prolonging the service of wood fence posts, a number of additional posts were set that had been given a 5-hour double tank butt treatment in creosote, and the tops painted with hot creosote. These posts are as yet all good except the soft maple posts, which failed after two years, and the sycamore posts, two of which failed after two years. Data on other posts are tabulated.

Experiments on the use of the sprout machine by Wooley, C. A. Helm, and A. J. McAdams showed that stumps should be cut low, so that they will not catch the frame of the machine and slow up the beater chains when the machine passes over them. The sprouts and brush should be cut clean when the timber is removed. The machine should be used the first year after the timber is removed, since second-year growth is too large for the most effective use of the machine. Apparently two strippings per year are necessary.

Data from a continuation of experiments on the draft of wagons, by Wooley, are tabulated (see also on page 780). It was found from tests in cultivated land that a saving in draft of 46.5 lbs. per ton of load was accomplished by increasing the height of wheels from 38 to 42 in., while an average reduction of 118.5 lbs. in draft was obtained by using 4-in. tires in place of 1.5-in. tires. The high wheel, narrow tire wagon had about the same draft as the common low wheel, wide-tire wagon, but the convenience of the low-wheel wagon is considered to indicate its desirability for farm use. Neither the height of wheel nor the width of tire had any marked effect on the draft on hard-surface roads.

A continuation of the draft tests of plows by Jones and F. L. Duley showed that within a range of moisture conditions set for plowing there was a tendency for the draft to increase as the moisture content decreased.

Data, by Jones, from surveys of farms using acetylene lighting systems, electricity from central stations, and electricity from individual plants, and data on the cost of fuel for an automatic electric plant and of power for operating an electrically driven milking machine are also included.

Surface water supply of North Atlantic slope drainage basins, 1923 (*U. S. Geol. Survey, Water-Supply Paper 561 (1925), pp. VI+294, pls. 3*).—This report, prepared in cooperation with the States of Maine, New Hampshire, Vermont, Massachusetts, New York, and New Jersey, presents the results of measurements of flow made on streams of these basins during the year ended September 30, 1923.

Preliminary report on the geology and water resources of the Mud Lake basin, Idaho, H. T. Stearns and L. L. Bryan (*U. S. Geol. Survey, Water-*

Supply Paper 560–D (*1925*), *pp. IV+87–134, pls. 2, figs. 2*).—Studies conducted in cooperation with the U. S. General Land Office, Idaho Department of Reclamation, and Idaho Bureau of Mines and Geology of a region lying some distance north of Idaho Falls and covering approximately 4,000 square miles, are reported.

The data indicate that the total supply of water which appeared at the surface in Mud Lake and vicinity from April 1, 1921, to March 31, 1922, amounted to about 162,000 acre-ft., of which 95,000 acre-ft. appeared in Mud Lake, 26,000 in five smaller lakes or reservoirs, and 41,000 was discharged by evaporation and plant growth. Of the total that appeared at the surface, about 96,000 acre-ft. or a little more came from underground sources, about 47,000 acre-ft. flowed into Mud Lake from Camas Creek, and 19,000 acre-ft. fell upon the wetted area as rain or snow. The aggregate flow of Camas and Beaver Creeks amounted to 143,000 acre-ft. during the year ended March 31, 1922. A large part of this water apparently reappeared at the surface in Mud Lake and vicinity.

The data show that the supply of Mud Lake for the year ended March 31, 1923, was greater than that for the previous year, indicating that the supply of Mud Lake is still increasing. It is stated that conditions do not appear to be promising for diminishing the natural losses from the area by further diking the lakes so as to decrease their areas. The natural losses will, however, be diminished by a more nearly complete ultilization of the water.

It is also suggested that another promising possibility is to reduce the evaporation, transpiration, and percolation losses by pumping from wells where the ground water is nearly at the surface and where the water-bearing lavas are very permeable.

Index of analyses of natural waters in the United States, W. D. Collins and C. S. Howard (*U. S. Geol. Survey, Water-Supply Paper 560–C* (*1925*), *pp. II+53–85*).—A list of published collections of analyses of natural waters of the United States is presented, which is intended to include all Federal and State reports of geological surveys, experiment stations, and health departments. In addition references are given to journal articles that contain collections of analyses.

Chemical character of ground waters of the northern Great Plains, H. B. Riffenburg (*U. S. Geol. Survey, Water-Supply Paper 560–B* (*1925*), *pp. II+31–52, figs. 4*).—The area discussed in this report forms the northern part of the Great Plains, and extends from the eastern border of the Dakotas to the foothills of the Rocky Mountains and from the Canadian border into northern Wyoming and South Dakota.

The relative proportions of the several constituents in the ground waters of the area, whether from the fresh-water deposits or from the rocks that were laid down in a salty sea, indicate that the ground waters are in general of meteoric origin, and have replaced the waters of sedimentation. This conclusion is supported by the fact that they contain only small quantities of chloride. The deep seated waters in the east end of the area may be mixtures of connate and meteoric waters.

The changes in the waters from the time they entered the soil as rain to the time that they were analyzed have resulted from the solution of such compounds as sulfates and carbonates of calcium, magnesium, and sodium; from the redeposition and exchange of part of the constituents; and from chemical reactions brought about by the oxidation of pyrite or by the reduction of sulfates, whether by bacteria or organic matter. Some of the shallow waters have been concentrated by evaporation, but there is little evidence of such concentration of the deep-seated waters.

Water power and irrigation in the Madison River basin, Montana, J. F. Deeds and W. N. White (*U. S. Geol. Survey, Water-Supply Paper 560–A (1925), pp. II+30, figs. 2*).—The results of a survey of the water power and irrigation possibilities in the Madison River basin, Mont., are presented.

It is stated that the basin yields annually more than 1,400,000 acre-ft. of water which can be used for the development of hydroelectric energy and for irrigation. It is estimated that the undeveloped power resources on the river amount to 136,000 h. p. About 2.1 per cent of the drainage area is irrigated. In parts of the basin are flood plain areas that may be susceptible of successful reclamation by drainage, diking, and irrigation.

The stovepipe or California method of well drilling as practiced in Arizona, H. C. Schwalen (*Arizona Sta. Bul. 112 (1925), pp. 103–154, figs. 26*).—A detailed description of this method as it is used in Arizona and of the apparatus is presented. Strictly speaking, the stovepipe method of well drilling is the drilling of wells with a mud scow, using the stovepipe casing, which is forced down with hydraulic jacks. The mud scow is a drilling tool similar to the ordinary sand bucket or bailer, but it is made extra heavy and is equipped with a heavy steel cutting shoe. It serves both as a drilling tool and as a bailer for cleaning out the hole. In Arizona the drilling is often done with solid tools or a combination of both solid tools and the mud scow.

The effect of beet pulp upon Portland cement concrete and mortar, O. V. Adams (*Colorado Sta. [Bul.] 306 (1925), pp. 3–14, figs. 6*).—Studies are reported which showed that beet pulp had a destructive effect upon both the mortar and concrete specimens used in laboratory tests. This action was not great up to 150 days of storage of the specimens in the beet pulp, but increased progressively for longer periods.

The results of tests and field observations showed that while there is no doubt that concrete and mortar are affected by beet pulp, it can not be said that the rutting and wear on the concrete pavement at Loveland, Colo., over which beet pulp has been hauled since 1915, has been due to the action of pulp drippings alone.

In the laboratory tests the tension specimens stored in pulp for 153 days showed no appreciable reduction in strength, but did show a marked reduction after 383 and 709 days of storage. The average strength of tension specimens stored for 709 days in beet pulp was only 65 per cent of that of specimens stored in moist sand.

There was a slight reduction in the compressive strength of cylinders stored in pulp for 153 days as compared with that of cylinders stored in sand. The compressive strength after 383 days of storage increased over that for 153 days. There was a marked reduction in both the actual compressive strength and the compressive strength ratio of all series for 709 days of storage as compared with 383 days of storage.

The abrasion-loss ratio was always greater than one, and increased progressively as the storage time was increased. The pulp storage cubes were lighter at the end of all three storage periods than the sand storage specimens.

Public Roads, [February, 1926] (*U. S. Dept. Agr., Public Roads, 6 (1926), No. 12, pp. 253–276+[2], figs. 3*).—This number of this periodical contains the status of Federal-aid highway construction as of January 31, 1926, together with the following articles: A General Formula for Waterways, by C. S. Jarvis; Urban Aspects of Highway Finance, by J. Viner; and Efficiency in Concrete Road Construction.—Part IV, The Organization and Equipment of a Concrete Paving Operation, by J. L. Harrison.

The draft of farm wagons as affected by height of wheel and width of tire, J. C. Wooley and M. M. Jones (*Missouri Sta. Bul. 237 (1925), pp. 14,*

figs. 11).—The results of 629 tests of the draft of farm wagons as affected by height of wheel and width of tire are summarized.

These results indicate that increasing the width of tire from 1.5 to 4 in. was more effective in decreasing the draft than was increasing the height of wheel from 38 to 42 in. Increasing the height of wheel or width of tire was found to become less effective as the density of the road surface was increased. There was very little difference in the draft of different kinds of wheel equipment on a concrete roadway. The advantage of wide tires was indicated in three conditions out of four, being negligible on pavement or hard, dry roads, but more pronounced for farm or field conditions. Six-inch tires caused a decrease in draft on all of the roadways tested, the draft decrease being greatest on plowed ground.

A mathematical analysis of the draft of a farm wagon is included, on the basis of which information on the selection of a farm wagon is presented. It is stated that 36-in. front and 40-in. rear wheels equipped with 4-in. tires appear to be the logical choice for a wagon to meet the needs of the average farm.

Dairy buildings for Kansas, J. B. Fitch and V. R. Hillman (*Kansas Sta. Bul. 236* (*1925*), *pp. 4–45, figs. 40*).—This bulletin, prepared in cooperation with the engineering experiment station of the Kansas State Agricultural College, presents information on the planning and construction of dairy barns to meet Kansas dairy conditions, together with data on necessary accessories and equipment and an appendix listing available dairy barn and dairy equipment plans.

Some factors influencing flue velocities in barn ventilation, M. A. R. Kelley (*Agr. Engin.*, *6* (*1925*), *No. 12, pp. 303–305, figs. 3*).—Studies conducted by the U. S. D. A. Bureau of Public Roads on the subject are reported.

The results indicate that the principal factors affecting flue velocities are temperature, wind, and type of construction. A study of available data indicated that there is a close relationship between temperature difference and flue velocities when the ventilation is unrestricted and unaffected by the wind, but that when the ventilation is restricted and other variable factors are introduced there may be a wide variance in this relationship. It is concluded that if flue temperatures do have an effect on flue velocity, it will be necessary to provide insulation in order to maintain them. The amount of insulation required can be determined only by further study of flue temperatures and the factors affecting them.

Wind was found to affect the ventilation of a barn by both pressure and suction. Tests made under field conditions showed that the wind has little effect on the amount of ventilation at velocities below 4 miles per hour, and that it is not often a dominant factor until after it exceeds 10 miles per hour. At velocities greater than this the effect is noticeable, but its full effect is seldom obtained in field tests except during warm weather, as the ventilation is generally restricted at the colder periods in proportion to the velocity of the wind. The maintenance of ventilation during periods of calm is considered to be of greater importance.

Tests of the influence of wind direction on the velocity of air passing through intakes showed that the velocity of the incoming air was the same on both sides of the barn when not influenced by the wind direction. There was not much variation in the readings on the leeward side.

It is stated that there are many construction features which affect the design of an efficient ventilating system, but that most of these can be controlled and adapted to meet specific conditions. It appears that in actual practice the outside temperatures bear a closer relationship to flue velocities than do temperature differences. The relationship of temperature differences

to flue velocities is also quite apparent under unrestricted ventilation. However, this relationship is often subject to wide variations by adjustment of the ventilator system and variation in wind velocities.

The problem of common storage for eastern apple growers, J. L. Strahan (*Agr. Engin., 6 (1925), No. 11, pp. 264, 265, 270, fig. 1*).—In a contribution from the Massachusetts Experiment Station an analysis of the problems involved in the development of common storages for apples in the eastern part of the United States is presented.

The conclusion is drawn that the main problem is to provide some means for producing and maintaining storage temperatures as low as 40° F. or less in cellar storages in the early storage season. Studies under way at the station indicate that this may be accomplished by the use of ice, either with or without salt, to hasten the cooling, and either with or without insulation against ground temperatures as may be found necessary. It is stated that a series of tests to determine proper methods of controlling ventilation and humidity, and the effects of different methods of handling these factors on the quality of stored fruit, should be conducted in connection with trials for temperature control to establish their interrelations.

Other problems in connection with the development of apple storages are enumerated. In this connection attention is especially drawn to the question of how important is temperature control in comparison with the need for ample ventilation early in the season.

RURAL ECONOMICS AND SOCIOLOGY

Research in rural economics and rural sociology in the Southern States since 1920: A list of the published, unpublished, and current studies (*U. S. Dept. Agr., Bur. Agr. Econ., Agr. Econ. Bibliog. 10 (1926), pp. IV+44*).—This is a mimeographed list of published and unpublished studies and current projects compiled in the library of the Bureau of Agricultural Economics under the direction of M. G. Lacy.

Economic periodicals of foreign countries published in the English language: A selected list, compiled by L. O. Bercaw (*U. S. Dept. Agr., Bur. Agr. Econ., Agr. Econ. Bibliog. 11 (1926), pp. [2]+16*).—This mimeographed selected list includes certain international publications and others from Africa, Asia and the Near East, Australia, Europe, Mexico, and South America.

[Investigations by the rural life department at the Missouri Station], O. R. Johnson et al. (*Missouri Sta. Bul. 236 (1926), pp. 68–76*).—Reports are submitted on projects in rural economics and sociology carried on in 1924–25. Data on the following have not been noted hitherto:

Cost of producing farm products under farm conditions, O. R. Johnson and B. H. Frame.—The acre costs on corn, wheat, and oats for 1924 are tabulated, and the cost of making silage is computed for the same year from data on factor requirements gathered in 1918–19. A cost per ton of $5.90 is arrived at in this manner. Also an average cost of $43.94 per acre for producing cotton in southeast Missouri was determined from detailed records taken on 10 farms.

The agricultural and market value of Missouri farm lands, O. R. Johnson.—A summary is given of the market value per acre of farm land in Boone County in 1924 and the relationship between sales and assessed value.

Farm cost accounting, O. R. Johnson and B. H. Frame.—Financial records from 14 farms for 1924 are summarized, and the net profit per acre and returns per hour of man labor are shown for corn, oats, wheat, alfalfa, other hay, and miscellaneous crops. The net profit and returns per $100 of feed

and per hour of man labor are tabulated for cattle, hogs, poultry, and sheep. The difference in importance of the two factors with different classes of livestock is brought out.

The standard of living on the farm as a factor in cost of production, O. R. Johnson and B. H. Frame.—Comparison is made of farm expenses, receipts, and net income with living expenses per person on 5 low, 4 medium, and 5 high standard of living farms. A somewhat parallel increase in living expenses with farm receipts is indicated, although net income does not show any definite relationship to living expenses.

Cost of family living on the farm, O. R. Johnson and B. H. Frame.—Family living expenses in 1924 classified as items bought (69.92 per cent) and those furnished by the farm (30.08 per cent) are tabulated.

Land tenure in Missouri, O. R. Johnson.—Itemized costs per head per month on dairy, beef, and other cattle, brood sows, and all hogs, and those per head per year on horses and brood sows were determined, together with costs per farm on miscellaneous items to be used in arriving at equitable renting contract terms. The costs of crops were taken from data reported in the first project above.

Physical, economic, and social factors as determinants in certain rural pathological and social conditions in Boone County, Missouri, B. A. McClenahan.—Facts relating to poor relief and institutional commitments among persons and families living in the country are cited from the proceedings of the Boone County court.

Distribution of farm labor, O. R. Johnson.—The percentage distribution of man and horse labor on household, real estate, and outside activities are reported by months for the period 1913–1923, as well as general farm activities, garden and orchard work, feed and seed production, and equipment.

The marketing of cabbage, E. G. Misner (*New York Cornell Sta. Bul. 443 (1925), pp. 137, figs. 44*).—This publication has been prepared to accompany a study previously noted (E. S. R., 52, p. 589), in which the growing of cabbage as a cash crop with dairying is discussed. Statistics of cabbage production in the United States and in New York State, shipments and freight rates, and studies of the correlation between rainfall and cabbage production are presented. Detailed records covering the cabbage shipping and storing operations of a produce dealer at Little York, N. Y., since about 1894, have been analyzed and summarized (pp. 45–74, 80–88), and some information with respect to storage houses in the State was gathered by questionnaires.

The production of and receipts from cabbage on one particularly successful farm at Little York are discussed. The conclusion is that a consistent policy of increasing the acreage after a year of low prices and decreasing it after one of high prices would have resulted in a greater income from cabbage, the reason being that during the last 9 years of the period the rainfall over the commercial cabbage district so varied that dry years occurred when the acreage was large.

Considerable attention is given to predicting the price, the amount of rainfall being taken as a substitute for production. The correlation between rainfall, total tons of cabbage produced in New York, and the November price for cabbage to growers at Little York based on the average, 1915–1923, is graphically presented. It is calculated that if cabbage is to maintain the same purchasing power that it has had for the past 10 years, the general price level remaining the same and the rainfall amounting to 75 per cent of normal, the November price might be expected to be approximately $28 a ton. If the rainfall should be 125 per cent of normal, the forecast price would be approximately $4 a ton.

Statistics of unloads and wholesale prices, including quotations on late cabbage and on early cabbage from specific important producing regions outside of New York State, are also tabulated, illustrated, and discussed.

Cooperative marketing of cotton, G. O. GATLIN (*U. S. Dept. Agr. Bul. 1392 (1926), pp. 48, figs. 11*).—Fifteen State and regional cooperative cotton marketing associations that have been formed since 1920 are listed, and their organization and operation are described. Under the topic of principles and policies are discussed the association agreement, the contract, the membership, democratic control, management, organization by commodity, large scale organization, nonstock nonprofit form, reserves, orderly marketing, merchandising, pooling, and locals. The methods and practices described include delivery, warehousing, insurance, sampling, classing, financing, distribution, agricultural credit corporations, selling, accounting, and field service.

Cooperative marketing of tobacco: A selected list of references, compiled by K. F. WILLIAMS (*U. S. Dept. Agr., Bur. Agr. Econ., Agr. Econ. Bibliog. 13 (1926), pp. [4]+5*).—This mimeographed bibliography is confined to books, bulletins, and economic and general periodicals.

Co-operative marketing of livestock in Nebraska, H. HEDGES and H. C. FILLEY (*Nebraska Sta. Bul. 209 (1925), pp. 3–38, figs. 12*).—This publication is based on a marketing survey made during the summer of 1923, in which complete records were secured from 20 organizations. In an introductory discussion the principal markets for Nebraska livestock are indicated, the history of cooperative livestock shipping in this region is briefly related, and reasons for organizing and types of cooperative shipping organizations are brought out. An analysis of marketing costs is also presented, including data from Omaha, St. Joseph, Kansas City, and Denver.

The effect of straight and mixed shipments, season, average weight of hogs shipped, total weight of hogs loaded in the car, and distance to market and the time in transit upon loss from shrinkage, crippling, and death is brought out. Such loss is found to be the result of many factors, the effect of any one of which is difficult to isolate. The percentage relation of net proceeds to gross sales is high in general. Marketing costs are considered as terminal charges, transportation, and local expense. The first, consisting of commission, yardage, and feed, makes up a little less than one-third of the total cost, transportation charges 54.6 per cent, and local expense 16 per cent. Of terminal costs, commission charges show a variation of from 67.1 to 108.5 cts. per 1,000 lbs. of livestock shipped, yardage from 40.7 to 56.4, and feed from 26.3 to 42.5 cts. per 1,000 lbs. In conclusion, problems and practices of local cooperative livestock marketing associations are discussed.

A preliminary survey of milk marketing in New York, L. J. NORTON and L. SPENCER (*New York Cornell Sta. Bul. 445 (1925), pp. 51, figs. 17*).—This study brings together certain facts relating to the production and distribution of the milk supply of New York City and neighboring towns.

The daily average receipts of milk in the New York market have increased more than 6 times since 1885, and those of cream 10 times, the per capita consumption of milk having increased 85 per cent, while that of cream more than tripled. This is accounted for largely by improved quality. Seasonal variations and temporary fluctuations are analyzed, and numerous maps have been prepared showing the extent of the milk and cream shipping areas and the utilization of surplus milk at country plants.

Making use of such statistics as are available, the authors have endeavored to calculate the available supply. They show graphically and in tables average

daily quantities handled by country shipping plants, daily receipts in the New York market, and monthly and seasonal variations.

At present, very little milk is produced within 50 miles of New York, and more than 98 per cent is shipped in by rail. In 1916 and in 1925 the maximum distance was 469 miles. The number of dairy cows in the shipping area is now slightly less than in the same counties 20 years ago. The average quantity of milk produced per cow, however, has increased about 25 per cent. The quantity produced varies from year to year, depending primarily on relative prices received for milk and on weather conditions. The drastic increase from 1911 to 1916 was coincident with a decreased purchasing power of milk. Over the territory as a whole, production has been relatively greater in August, September, and October in recent years, although the greatest relative increase in price is for the months of May, June, and July.

The process of marketing milk is described and types of cooperation among the milk producers are noted.

In the four years, 1922 to 1925, the dealer's gross margins on retail sales of bottled milk averaged 7.3 cts. a quart, or about 50 per cent of the retail price. The distributor's margin on milk sold at wholesale was considerably less.

Management problems of farmers' elevators, H. B. PRICE and C. M. ARTHUR (*Minnesota Sta. Bul. 224 (1925), pp. 94, figs. 17*).—Data for this study were secured from the annual audits of over 100 elevators located in those sections of Minnesota, North and South Dakota, and Montana that are tributary to Minneapolis and Duluth grain markets, covering the market seasons 1917–18 to 1923–24, inclusive. Commission merchants at Minneapolis and 55 elevator operators in Minnesota contributed information, and 30 operators of independent elevators were interviewed. The object of the investigation was the analysis of practices and the pointing out of elements of strength and weakness.

The importance of retaining a well-qualified, responsible manager at an adequate salary is emphasized. Costs of operation are summarized under the heads of management; building and equipment; office expense; extra labor; power, light, and heat; taxes; insurance; interest; direct sideline cost; and miscellaneous items; and a more detailed discussion of causes for variation is found in the analysis of practices, including hedging; storing for farmers; when, how, and where these elevators sell grain; meeting competition; determining grades, dockages, and weights; use of fixed and operating capital; buying policies; cleaning; insurance; and sidelines.

Of 30 independent elevators 6 and of 17 representative Minnesota farmers' elevators interviewed on this subject only 13 were not hedging. The extent of the practice and methods were found to vary widely, being affected by market conditions, methods of sale, attitude of manager and directors, negligence of manager, dealing in futures for others, volume of grain handled, and variations in the relation of cash and future prices.

The majority of the elevators stored grain for producers, especially in the northwestern and southwestern sections of the State, where wheat and rye and corn and oats, respectively, are the principal grains. The grain stored is disposed of by putting it in special bins reserved for stored grain; holding an equivalent in the general stocks of the elevator; shipping, selling, then hedging the grain; storing at terminal elevators; and shipping and selling without hedging.

Practically all farmers' elevators are organized as stock corporations on the plan of one vote for each shareholder, and most of them are incorporated

under general corporation laws, although a few have reorganized under the cooperative laws. More than 95 per cent of grain marketed is bought for cash, and trading is done on varying margins, most of which fall within the range of from 2 to 10 cts. per bushel, including, however, income from sidelines and elevator services rendered patrons. Of the 109 elevators studied, 21 had net losses amounting to as high as 4.6 cts. per bushel and 21 had net gains of from 4 to 10 cts. The average for all was a net gain of 2 cts. per bushel. All pooling is done by central cooperative marketing associations. Only 40 per cent of Minnesota farmers' elevators elevate grain for farmers and then only occasionally, and very little grain is cleaned for them. About 30 per cent of the elevators do not clean grain at all. Sideline business constituted 8.6 per cent of the total business of all elevators in 1922–23.

Crops and Markets, [February, 1926] (*U. S. Dept. Agr., Crops and Markets, 5 (1926), Nos. 6, pp. 81–96; 7, pp. 97–112; 8, pp. 113–128; 9, pp. 129–144*).—The usual tabulations and summary articles review the situation in the market each week of leading agricultural products. Unusual features of the Michigan potato deal are discussed in No. 6. Foreign crops and markets notes are given.

Monthly Supplement to Crops and Markets, [February, 1926] (*U. S. Dept. Agr., Crops and Markets, 3 (1926), Sup. 2, pp. 33–72, figs. 4*).—This number features livestock statistics, showing the estimated number and value on farms by principal classes, January 1, 1920–1926, by States; monthly farm prices of animals and animal products, 1910–1926; statistics of animals slaughtered and meat supplies; livestock inspected at markets for shipment to country; and corn and hog ratios, 1923–1925. Farm wages rates are reported by geographical divisions and by States for recent years, and index numbers are shown for the period between 1866 and 1926. The percentage reduction from full yield per acre is shown for crops. Other crop and livestock statistics, reports of cold storage holdings and shipments, and the usual estimated value of farm products and prices received by the producer are included.

Monthly Supplement to Crops and Markets, [February, 1926] (*U. S. Sta. Tech. Bul. 29 (1925), pp. 3–40, figs. 14*).—Certain factors that have been discovered to be affecting the movements of potato prices are discussed here, including the value of the dollar, the trend of the value of potatoes, fluctuations in production, the price of potatoes in August, variation in quality, and loss in storage.

Changes in the value of the dollar, as indicated by the general price level or a U. S. Bureau of Labor Statistics index number of 400 commodities, are found to explain a part of the changes in the price of potatoes over a period of years. The effect is removed by dividing the price of potatoes by the index number of the general price level, and while wide fluctuations still appear they are somewhat smaller. Potato prices were rising gradually in the period 1902–1919. When the effect of this changing normal value is removed and the remaining fluctuations are expressed in terms of percentages of normal, the curve illustrating the result shows practically as great fluctuation as before, however. The production of the late crop in 27 States since 1902 relative to normal is ranged, and the price in percentage of normal corrected for the factors mentioned above is indicated. It is found that when production is, respectively, 20, 10, and 0 per cent above normal the price will probably be 29, 17, and 0 per cent below, while with production 10 and 20 per cent below, the price will be, respectively, 26 and 70 per cent above normal. After the effect of this and the preceding factors has been removed, only a relatively small amount of the original fluctuation remains.

A high price in August tends to increase the price later in the season. For every 1 per cent that the August price in New York City varies from its normal, the price of potatoes in St. Paul and Minneapolis for the season September to May will vary 0.3 per cent from its normal. This factor removed, there remain yet unexplained high prices in 1903 and 1919 and low ones in 1905, 1916, and 1923. The difference between the price of Minnesota potatoes in St. Paul and Minneapolis and that of Maine and State and western potatoes in New York in November or later is taken as a statistical measure of quality, and this factor being removed, only relatively small changes remain.

From calculations employed here, it appears that an increase in price of 28.8 cts. per hundredweight may be expected from October, the month of lowest, to April, that of highest price. It is unusual, however, for the price during any one year to show the normal or average seasonal change.

Tables and formulas are given.

An analysis of the apple industry of the Annapolis-Cornwallis Valley, C. C. Colby (*Econ. Geogr., 1 (1925), Nos. 2, pp. 173–197, figs. 13; 3, pp. 337–355, figs. 15*).—A highly specialized and prosperous industry in Nova Scotia is described. Its localization in Annapolis, Kings, and Hants Counties is striking. A notable increase in production has taken place in recent years, 1919–1924, not due, however, to the coming into production of new orchards but rather to a better performance by the orchards both in total yields and in the percentage of trees producing. Climate and weather hazards, production as related to orchard sites, crop associations, and orchard practices are described.

The outstanding geographic asset of the ample industry here is the advantageous position of the producing district with reference to the North Atlantic trade route to Great Britain, which is the chief market. Low rail rates to points of export prevail, the port of Halifax being the most important one of these. Some attention is given to evolution of the marketing system, including cooperative efforts among the producers.

The transition from primitive to modern agriculture in Palestine, I. Elazari-Volkani (*Palestine Econ. Soc. Pub. 4 (1925), pp. 52*).—Soil, labor, and general crop conditions in Palestine are described. The transition from primitive hand farming to the use of modern farm machinery is thought to be particularly difficult in view of the limitations of the markets in which the increased production could be disposed of. The author urges the establishment of a so-called national fund to be used in bringing the land to the level of productivity and the worker to the level of fitness usual in more advanced countries. Large tracts of land must be acquired. The various zones of intensive and extensive cultivation which exist in this region must be recognized, and adequate provision must be made for financing and educating settlers.

The agricultural argument, D. H. Macgregor (*Econ. Jour., 35 (1925), No. 139, pp. 389–397*).—The author's aim is to discount what he regards as superlative judgments unfavorable to British agriculture which have been adopted largely to further political ends. He shows that a composite index of productivity, in which indexes of yield are weighted by the percentages of the cropped area under each of the crops for which there are returns, is for Belgium 164, France 92, and for Britain, Germany, Denmark, and the Netherlands each about 130. He holds that there are certain fallacies in the case presented for the high productivity of small holdings and misleading implications in discussions of food production on the basis of the calorie content of crops. Certain questions are raised with respect to the alleged decline in the rural population of Great Britain.

The problem of the food supply and increasing agricultural returns [trans. title], F. Aereboe (*Weltwirtschaft. Arch., 21 (1925), No. 2, pp. 157–183*).—The evolution of agriculture from the domestication of animals in the nomad stage, which followed the hunting and fishing stages of human culture, is regarded as the most important development in the history of man's efforts to combat the law of diminishing returns. Improvements in agricultural practice and irrigation, drainage, and other means of increasing the cultivable area are pointed to by the author in maintaining his position that the Malthusian doctrine, implying a relatively decreasing food supply, does not actually present insurmountable difficulties.

Proposed world agricultural census of 1930–31, L. M. Estabrook (*Rome: Internatl. Inst. Statis., 1925, pp. 8*).—A preliminary statement outlines the plan of procedure under the present program of this census project. One year is allowed for the preparation of standard census forms and about three years for promoting sentiment and procuring the cooperation of the various Governments.

[Reports on the grain trade of Canada, 1923 and 1924], W. Dougan and E. A. Ursell (*Canada Bur. Statis., Rpt. Grain Trade Canada, 1923, pp. 192, figs. 9; 1924, pp. 175, figs. 6*).—These reports succeed an earlier one (E. S. R., 51, p. 296).

AGRICULTURAL AND HOME ECONOMICS EDUCATION

[Statistics of land-grant colleges for the years ended June 30, 1923 and 1924], W. J. Greenleaf (*U. S. Bur. Ed. Buls. 19 (1925), pp. V+51, figs. 2; 26 (1925), pp. V+51*).—Statistics have been prepared from audits of the annual reports of the presidents of 69 land-grant colleges in the United States. They set forth separately for the institutions attended primarily or exclusively by white and colored students their new buildings, staff members, student enrollment, summer schools, degrees conferred, salaries, income, property, and the status of the various funds from which support is derived.

The report for 1923 presents a general comparative discusssion of staff and student enrollment, the enrollment in various curricula, the first degrees granted, the Alaska Agricultural College and School of Mines that was opened during the year, and a summary of special surveys of land-grant colleges in California, Massachusetts, North Carolina, and Oklahoma. In general, the enrollment in agricultural curricula has been falling off or has remained stationary for several years, while that in home economics has more than doubled since 1913 and that in engineering has increased markedly.

The report for 1924 presents some historical notes regarding the grants to States since 1862. The manner of using the funds is pointed out, and the status of military training is briefly discussed.

Clothing club manual, M. C. Whitlock (*Illinois Sta. Circ. 304 (1926), pp. 110, figs. 77*).—This has been prepared for members and leaders of clothing clubs who are studying construction, the material having been selected with a view to helping in the perfecting of processes and developing an appreciation of good workmanship. In addition to describing equipment, it gives directions for stitches, fastenings, seams, hems, biases, facings, bindings, plackets, trimmings, repairing, and garment construction.

FOODS—HUMAN NUTRITION

A chemical study of the flesh of emaciated cattle, R. Hoagland and W. C. Powick (*Jour. Agr. Research [U. S.], 31 (1925), No. 11, pp. 1001–1013*).—This study was undertaken for the purpose of determining some reliable means in

food control work of detecting extreme emaciation in beef flesh. "'Very thin' cattle may be defined as cattle with a much shrunken musculature and with practically no fat deposits, but with no apparent abnormal condition of flesh, connective tissue, bone marrow, or organs. 'Extremely emaciated' cattle, on the other hand, may be defined as cattle in which emaciation has proceeded to such a degree that the flesh, connective tissue, and bone marrow have become distinctly abnormal in appearance." In this paper these terms are applied to those animals only that are free from evidence of recognized disease.

The material for examination included 20 hind quarters from extremely emaciated and 12 from very thin cattle. A rather complete analysis was first made of 3 quarters from the first group, and the results obtained were compared with results previously obtained on fat steers. This comparison showed for the emaciated animals a lower content of ash, ether extract, total nitrogen, total protein, total phosphorus, soluble phosphorus, soluble organic phosphorus, and free acid; normal values for purines and creatinine; entire absence of sugar; a much higher content of moisture, and a wider range between protein and moisture than the flesh from fat cattle.

In continuing the analyses, the work was restricted to the determination of moisture, ash, fat, total nirogen, and in some cases sugar and urea. The average values in terms of fat-free material are given in the accompanying table:

Average composition of flesh from extremely emaciated, from very thin, and from fat cattle

Class of cattle	Number of animals	Moisture	Ash	Total nitrogen	Protein (N×6.25)	Ratio protein to moisture
		Per cent	*Per cent*	*Per cent*	*Per cent*	
Extremely emaciated	20	80.45	0.99	3.03	18.94	1:4.2
Very thin	12	79.38	1.03	3.17	19.80	1:4.0
Fat	5	76.27	1.10	3.54	22.09	1:3.5

It is believed that the ratio between protein and moisture in the flesh of very thin or extremely emaciated cattle, which with rare exceptions is greater than 1:4, will prove of value in classifying such animals for food purposes.

Composition of marrow of fresh and cured hams, W. F. SCHROEDER and D. EDELMAN (*Jour. Agr. Research* [*U. S.*], *31* (*1925*), *No. 11, pp. 1015, 1016*).—To answer the question as to whether curing agents actually penetrate the bone marrow of hams, analyses were made of the marrow of the femur bones of three composite samples of fresh hams, three of hams cured by the usual process, and one of hams cured by a special process in which sodium nitrite was used in place of nitrate. These analyses showed a higher content of ash, sodium chloride, and nitrite in the cured samples than in the fresh, thus answering the question in the affirmative.

The utilization of surplus plums, W. V. CRUESS (*California Sta. Bul. 400* (*1926*), *pp. 3–21, figs. 4*).—Various methods which have been tested experimentally are described for the preservation and utilization of cull and surplus plums in quantities.

The first and most essential method tested was a means of preserving the fruit until such time as it can be used. It was found that by crushing the fruit at a pressure sufficient to crush the pulp without breaking the pits enough juice can be liberated to give a solid pack which will freeze rapidly enough in a cold storage room to prevent fermentation. A 50-gal. barrel of

frozen fruit thaws so slowly that the fruit can be shipped some distance without danger of spoilage. Storage at 32° F. was also found satisfactory as a means of accumulating sufficient cull fruit where only a small amount is available at a time. Various methods are suggested for the utilization of the fruit thus preserved, and directions are given for the preparation of the various products, with estimated costs of production. Listed in decreasing order of their supposed desirability and chance of commercial success, these are frozen crushed plums for jam and jelly, butter and jam, plum jam pulp, plum-peach jam pulp, jelly, jelly juice, candy, candy base, beverage sirup, preserves, canned plums, and dehydrated plums.

Foods and drugs, J. M. Bartlett (*Maine Sta. Off. Insp. 115 (1925), pp. 8*).—This is the annual tabulation for 1924 of the results of the examination of food and drug samples collected by the inspectors of the division of inspection of the State department of agriculture (E. S. R., 52, p. 258).

Present status of home economics research at the agricultural experiment stations, S. L. Smith (*U. S. Dept. Agr., Off. Expt. Stas., Work and Expend. Agr. Expt. Stas., 1924, pp. 33–42*).—A survey is reported of the research projects relating to home economics under investigation at the State experiment stations at the close of 1924, as discussed editorially (E. S. R., 54, p. 301).

Review of the literature on infant feeding for 1924, R. D. Moffett (*Amer. Jour. Diseases Children, 30 (1925), No. 5, pp. 700–711*).—The topics considered in this review are breast feeding, bottle feeding, artificial foods, butter flour feeding, peristaltic function, and metabolism. Forty-two references to the literature are included.

A guide to good meals for the junior homemaker, R. Van Deman and C. L. Hunt (*U. S. Dept. Agr., Misc. Circ. 49 (1926), pp. 12, figs. 7*).—This is an adaptation of much of the subject matter of Farmers' Bulletin 1313 (E. S. R., 49, p. 158) to appeal directly to boys and girls or "junior homemakers." A description is first given of an imaginative world market or fair in which are brought together food products from all over the world and to which come people of all races to make their food purchases. The best selection of foods by the people of different nations is shown to follow the five food groups—vegetables and fruits, efficient protein foods, cereal foods, sweets, and fats—although differing within the group according to racial taste. Information on the essentials of good nutrition and practical suggestions as to wise combinations of food for the day's meals are included and weight-height-age tables for boys and girls are appended.

Effects of diastase and malt extract in doughs, F. A. Collatz and O. C. Racke (*Cereal Chem., 2 (1925), No. 4, pp. 213–227, figs. 7*).—To determine how much diastase, if any, should be added to a dough to secure maximum baking value without decreasing the color and texture of the resulting bread, a series of malt extracts was prepared of varying diastatic power up to 82.2° Lintner. These extracts were tested by the method of Collatz (E. S. R., 49, p. 12) for their digestive action on three commercial patent flours and doughs prepared from them. Baking tests were also carried out with the doughs.

The three samples of flour without added extract had diastatic values of 14.8, 17.6, and 18.2° Lintner, respectively. When autolyzed with and without added diastase, the first and third samples were almost alike in diastatic power, which was less than that of the second sample. This was also shown by determinations of the reducing sugars at various stages of fermentation.

The dough fermentations were carried on with three malt extracts, one non-diastatic and the other two having Lintner values of 33 and 82.2°, respectively. The reducing sugars in the doughs showed a prompt increase with

increasing diastatic power of the extracts. The time of fermentation was shortened by the added diastatic extract in the first and third flours and apparently lengthened in the second. The baking data showed an increase in volume and a decrease in the color of the crumb and the texture of the bread with increased diastase.

The addition of diastatic malt extract to flours of average baking strength is considered to decrease the quality of the resulting bread.

Researches on the food value of inulin and of legumes containing this carbohydrate [trans. title], L. EMERIQUE (*Ann. Physiol. et Physicochim. Biol., 1 (1925), No. 2, pp. 123–131*).—Feeding experiments conducted on guinea pigs are reported which indicate that in the Jerusalem artichoke inulin and the levorotatory substances accompanying it are completely assimilated.

Experiments with the pancreatic hormone insulin [trans. title], T. SHIMAMURA and R. TAKAHASHI (*Jour. Japan. Soc. Vet. Sci., 4 (1925), No. 1, pp. 69–88, pl. 1*).—Miscellaneous insulin studies are reported in Japanese and summarized in English essentially as follows:

In the extraction of insulin from pancreatic tissue, the use of sodium chloride or ammonium sulfate during the vacuum distillation of the alcoholic filtrate is recommended. On peptic digestion insulin loses about 25 per cent of its activity in 30 minutes and becomes entirely inactive in 1 hour. On tryptic digestion the activity is entirely destroyed in 30 minutes.

In mice about 1/100 of a rabbit unit of insulin per 10 gm. body weight is required to cause a hypoglycemic action, usually with convulsions, but sometimes only with the development of coma. The reaction is about the same with young albino rats of 20 to 50 gm. weight, using the same dose. In pigeons convulsions and coma do not follow the injection of large doses of insulin, although the blood sugar level is lowered by several rabbit units of insulin to about 50 or 60 per cent of the normal value. In horses hypoglycemic convulsions can be obtained by 1/2 rabbit unit of insulin per kilogram of body weight.

The efficiency of various sugars in relieving insulin symptoms in rats on the basis of glucose as unity is mannose 2, maltose 3, fructose and galactose more than 3, and arabinose more than 4.

Insulin has no action on the course of avian beriberi, and vitamin B in the form of oryzanin no effect upon insulin reactions.

The effect of insulin on the morphological blood picture, with a note on the relation of diet to the convulsions induced by insulin, V. E. LEVINE and J. J. KOLARS (*Amer. Jour. Physiol., 74 (1925), No. 3, pp. 695–707*).—Of particular interest in this paper is the discussion, based upon the authors' experience and upon evidence from the literature, that nutrition is an important factor in the utilization and toxic manifestations of insulin. "With reference to diet in diabetes, clinicians have thus far focused their attention upon glucose intake from carbohydrate, fat, and protein, and upon fat and glucose in relation to ketogenesis. Little or no emphasis has been laid on the necessity for vitamins and for inorganic components like iodine, iron, calcium, and phosphorus. Since diabetes usually takes a chronic course, it may be readily seen how a restricted and inadequate diet continued for a long period may result in the development of symptoms of a full-fledged or borderline deficiency disease with a resultant lowering of the resistence of the patient to combat successfully with his primary condition."

A bibliography of 59 references is appended.

Insulin: Its use in the treatment of diabetes (*Baltimore: Williams & Wilkins Co., 1925, pp. XV+242, figs. 7*).—Part 1 of this volume of the series of

Medicine Monographs is contributed by J. J. R. Macleod and deals with the physiology of insulin. A brief historical review of the literature leading up to the discovery of insulin is first given, followed by chapters on methods of preparing insulin; its effect on depancreatized dogs, on normal and hyperglycemic animals, and on the metabolism of phosphorus; physiological assay of insulin; and the ultimate fate of depancreatized dogs treated with insulin.

The longer clinical section, by W. R. Campbell, includes, in addition to chapters of special value to the physician on the general effects of insulin, the diagnosis of diabetes mellitus and its treatment by insulin, two of special value to the dietitian and diabetic patient on the dietetic treatment of diabetes and on recipes, tables, and food equivalents and food analyses.

An extensive bibliography is appended, and a folder entitled General Directions for Diabetic Treatment with Condensed Diabetic Diet Lists, by W. R. Campbell, accompanies the volume.

Protein storage in protoplasmic tissue, A. G. Hogan, W. S. Ritchie, and J. E. Hunter (*Missouri Sta. Bul. 236 (1926), p. 27*).—In this progress report data are given on the amount of globulin precipitated from solution by various methods, including electrodialysis in a specially constructed three-compartment cell. The results obtained by this method corresponded most closely with those obtained by saturation with lithium sulfate and half saturation with ammonium sulfate.

The racemization method was used to test the individuality of the proteins extracted from muscle tissue by 10 per cent NaCl, separated by the ammonium sulfate method, and dissolved in N/2 NaOH. The optical rotation of these solutions held at 37° C. and tested at 12-hour intervals was slightly different, indicating two proteins of different structure.

The reciprocal transformation of creatine and creatinine, VII [trans. title], A. Hahn and H. Fasold (*Ztschr. Biol., 83 (1925), No. 3, pp. 283–288*).—The object of this continuation of the investigation previously noted (E. S. R., 51, p. 557) was to determine whether creatine can be retained in the body of the rabbit, and if so whether with an increase in the body creatine there is a corresponding increase in the creatinine liberated.

Following long-continued subcutaneous injections of creatine there was no increase in the creatinine content of the urine, and the greater part of the creatine could not be found again. It is concluded that the greater part of the creatine enters into the body metabolism and is altered into substances of unknown nature.

Inorganic phosphorus in the blood of the new-born: Its seasonal variation and its relation to rickets, E. A. Riesenfeld, I. Handelman, and A. R. Rose (*Amer. Jour. Diseases Children, 30 (1925), No. 5, pp. 646–658, figs. 4*).—In an investigation extending over a period of 14 consecutive months, 1,439 inorganic phosphorus determinations were made on the blood of mothers (white and colored) and their newborn infants, and the data obtained were correlated with the factors causative of rickets, including the diet of the mothers and seasonal variations.

The average inorganic phosphorus content of the mother's blood at the time of delivery was 3.1±0.019 mg. and that of the newborn infants 4.12±0.028 mg. per 100 cc. No differences could be detected traceable to race or previous habitat (Tropics or Temperate Zone) or to the amount of time the mother spent out of doors during pregnancy. The factors influencing the phosphorus content of the blood of the infants appeared to be the diet of the mother, the available sunlight, and the relative humidity. The curves of available sunlight hours and inorganic phosphorus were parallel in the latter half of the year, the points of similarity in the sunlight curve preceding the inorganic

phosphorus by 1 month. An even closer parallelism was found to exist between the relative humidity and the content of inorganic phosphorus. The curve representing relative humidity showed a striking parallelism with that of the inorganic phosphorus throughout the year, the points of resemblance preceding the latter by 2 months. "The close relation between relative humidity and the inorganic phosphorus content of the newborn infant's blood is explained as an accentuation of the effects of the ultra-violet rays by removing minute particles which act as a ray filter from the atmosphere."

High energy chemistry and vitamins, E. C. C. BALY (*Jour. State Med., 33 (1925), No. 8, pp. 368–376*).—In this theoretical discussion the author states that every chemical reaction consists of three separate stages, "(1) the activation of the reactant molecules by the supply of a definite and specific increment of energy, (2) the reaction proper, whereby new molecules are produced in an activated condition, (3) the loss of energy by the resultant molecules, whereby they settle down into their normal and nonreactive state." All chemical reactions are divided into two main classes, those for which only a small increment of energy is required for activating the molecules and those for which a large increment is required. The second type of reaction, or high energy reaction, is illustrated by the formation of formaldehyde from carbon dioxide under the action of ultra-violet light. The theory is advanced that vitamins are compounds resulting from high energy reactions, and are thus in a state of high energy content to which their peculiar properties are due.

The question of vitamins in labeled preparations [trans. title], L. RANDOIN (*Ann. Falsif., 18 (1925), No. 198, pp. 325–331*).—A brief discussion of the technique employed by the author in detecting misbranding of commercial products advertised to contain one or more vitamins.

Inactivation of vitamin A by rancid fat, W. C. POWICK (*Jour. Agr. Research [U. S.], 31 (1925), No. 11, pp. 1017–1026, figs. 3*).—Three series of feeding experiments conducted on rats, using 12, 8, and 8 animals, respectively, are reported. The first and third consisted of a comparison of the nutritive value of sweet and rancid fat when fed to the extent of 16 per cent of a ration in which vitamin A was furnished chiefly in the form of dried egg yolk constituting 3 per cent of the ration. In the second the egg yolk was fed with starch apart from the rest of the ration and constituted a higher percentage of the ration, about 6.98 per cent in the case of the rancid fat group and 4.42 per cent of the control group.

As far as could be judged by the limited number of experimental animals, the rancid lard proved inferior to the sweet lard chiefly through causing a destruction of the vitamin A. In the experiment in which the vitamin was protected from the lard by being fed separately, the animals receiving the rancid lard grew and remained healthy and free from ophthalmia. In the first group one and in the third all of the rats on the rancid lard developed ophthalmia. The periodic nature of the growth curves of the animals on the rancid lard in the third group (the growth being accelerated with the introduction of freshly mixed rations) suggested that the destruction of vitamin A by the rancid fat is a gradual process. This is attributed to the oxidation of the vitamin by the organic peroxides of the rancid lard.

The distribution of vitamin B in the maize kernel, H. M. CROLL and L. B. MENDEL (*Amer. Jour. Physiol., 74 (1925), No. 3, pp. 674–694, figs. 9*).—This study of the distribution of vitamin B in the embryo, endosperm, and bran of white and yellow corn is similar in its scope and technique, except for the use of rats instead of mice, to the study of Bell and Mendel of the distribution of vitamin B in the wheat kernel (E. S. R., 47, p. 860).

In testing the whole kernel, two varieties of corn were used, a Yellow Dent Leaming variety and a white variety. The minimum amount of each to serve as the sole source of vitamin B for the normal growth of rats from 40 to 140 gm. was between 20 and 30 per cent of the ration. Several methods of separating the kernel of yellow corn into its constituent parts were used and yielded about 80 per cent of the entire kernel as endosperm, 13 per cent as embryo, and 7 per cent as bran. Contrary to the results obtained with wheat, practically all of the vitamin B was found to be located in the embryo. The endosperm contained practically no vitamin B and the bran only a very small amount, if any. That the failure to grow when endosperm and bran constituted a large portion of the diet was not due to any toxic substance was shown by prompt recovery on the same diet with yeast as a source of vitamin B. Commercially milled white corn embryo was not quite so effective as the hand dissected embryo of yellow corn. This is attributed to some loss of vitamin B in its production.

The difference in the results obtained with wheat and corn is thought to make impossible a general statement of the distribution of vitamin B in cereal grains and to necessitate the separate examination of each.

Vitamin B in the excreta of rats on a diet low in this factor, W. D. Salmon (*Jour. Biol. Chem., 65 (1925), No. 2, pp. 457–462, figs. 3*).—Evidence is presented that the feces of rats may be rich in vitamin B even when the diet is low in this factor. Rats that were declining on the basal vitamin B-free ration resumed growth when the diet was supplemented with 20 per cent of extracted velvet bean meal provided they had access to their feces, but did not grow on the same ration when kept on screens preventing access to the feces. Rats receiving as the sole source of vitamin B 10 per cent of dried feces from the above experiment grew at a rate comparable with that reported by Steenbock, Sell, and Nelson for 40 per cent of corn or oats (E. S. R., 49, p. 665).

As a possible explanation of the above results, it is suggested that the addition of the extracted velvet beans to the basal diet may have increased the undigested food residues in the intestinal tract, thus making conditions more favorable for bacterial growth and synthesis of vitamin B.

The causes of vitamin destruction in cooked and canned foods, H. A. Stillman (*Missouri Sta. Bul. 236 (1926), pp. 63, 64*).—A summary without experimental data is given of a study of the stability of vitamin C in tomato juice treated with N NaOH in the proportion of 7 cc. to 100 cc. of juice with and without subsequent shaking with an equal volume of H_2S gas, followed in both cases by heating in glass-top fruit jars (time and temperature not stated). After the preliminary treatment the samples were allowed to stand a week at room temperature and then retreated by adding 7 cc. of N HCl and boiling. A control sample of natural juice was heated without other treatment.

It is stated that the data showed that hydrogen sulfide protected the vitamin from the destructive effect of alkali, but that it was impossible to determine definitely whether the hydrogen sulfide-treated juice was superior to the heated juice or not. "Exhausting cans and using minimum head space should tend to preserve vitamin C. The use of the pressure cooker and deep covered dishes in cooking should tend to preserve vitamin C, when the physical structure of the plant is broken down so that oxygen is not retained in the tissues."

Vitamins D and E (*Jour. Amer. Med. Assoc., 85 (1925), No. 23, p. 1830*).—A brief summary of the occurrence and functions of vitamin D (antirachitic) and vitamin E (reproductive), with a list of references to the more important literature on vitamin E.

Toxin production by Clostridium botulinum in canned foods, L. Thompson and F. W. Tanner (*Jour. Infect. Diseases, 37 (1925), No. 4, pp. 344–352*).—

This investigation had for its original purpose a classification of canned foods as to their ability to permit the growth of toxin when inoculated with detoxified spores of *C. botulinum*, and was extended after the appearance of a paper by Schoenholz, Esty, and Meyer (E. S. R., 51, p. 168) to an attempt to explain the irregularity of toxin production in certain foods.

The methods and groups of foods tested were similar to those of the above noted study, and in general the results obtained were about the same. The foods tested which were not included in the earlier study were apples, blackberries, gooseberries, dill pickles, red kidney beans, Lima beans, hominy, and shrimp. Of these, the first four were found to belong to the acid group showing no toxin and the last four to the group of foods regularly toxic and showing signs of spoilage. Pumpkin was found to be irregularly instead of regularly toxic as noted by Schoenholz et al. Beets inoculated with one of the cultures of *C. botulinum* became regularly toxic, but the other cultures tested did not produce toxin.

In the extension of the work various extracts and liquors from canned vegetables were used as culture media in comparison with hormone and brain broth. An extract from white potato was found to be as satisfactory as standard medium for the growth of *C. botulinum*, but was not satisfactory for spore formation. This was also true of the hormone medium, while brain broth and the liquor from canned peas were very satisfactory for sporulation. Corn medium was inferior to that made from peas, and in unneutralized spinach liquor no growth took place. A further study of the spinach liquor showed that if the natural acidity (about pH 4.5) was neutralized growth of the organism took place, and further that the presence of a small amount of rotted material served to render the medium alkaline and permit growth. It is concluded that irregularity of toxin production in certain foods is due principally to variation in reaction, and that the reaction may be greatly affected by the quality of the material placed in the cans. A small amount of rotted material is thought to be capable of reducing the acidity to a point at which *C. botulinum* can grow and develop a toxin.

TEXTILES AND CLOTHING

The effect of humidity on the thermal conductivity of wool and cotton, H. STAFF (*Phys. Rev., 2. ser., 25 (1925), No. 2, p. 252*).—By placing layers of the material between a central electrically-heated disk and two outer heavy copper disks around which water is circulated, the thermal conductivity can be measured close to room temperature and with any desired moisture content of the samples.

A fairly linear relation was observed between conductivity and moisture content measured in percentage of dry weight. The increase in conductivity for three samples of wool of widely different dry weight was 2×10^{-6}, 1.7×10^{-6} and 1.9×10^{-6} for an increase in moisture of 1 per cent of the weight, and for two samples of cotton 3.9×10^{-6} and 4×10^{-6}. Studies of the moisture content for varying relative humidity showed that the conductivity increases more nearly as the square of the relative humidity.

Measurements of the reversing spiral in cotton hairs, W. L. BALLS and H. A. HANCOCK (*Nature [London], 117 (1926), No. 2936, p. 217*).—The spirals in the cell wall of cotton fibers may be dexter or sinister, and their reversals are apparently predetermined during growth in length. Genetic and ordinary environmental influences do not affect the statistical peculiarities of the reversals. The final mature length of the fibers and the time taken in reaching that length do affect the reversal distribution. Nearly all the seed fibers of

Gossypium begin to grow on a sinistral spiral. The angle of the helix varies around two modal values, but local variations are quite unaffected by inversion from dexter to sinister.

The selection and conservation of textiles (*Laundryowners Natl. Assoc., Dept. Research Leaflets 1-26 (1924), pp.* [27], *figs. 37*).—This series of popular leaflets describes and illustrates defects in fabrics due to the weave, knots, heavy threads, short fibers, false selvage, use of inferior material and over finishing, damage caused by dyes, removal of stains and razor cuts, and the effect of weathering on lace curtains. A test of the durability of a sheet in laundering is summarized, and the advantages of soft water are indicated.

The germicidal properties of soap, J. E. Walker (*Jour. Infect. Diseases, 38 (1926), No. 2, pp. 127–130*).—The studies previously noted (E. S. R., 54, p. 393) have been extended to include observations by the same technique of the effect of various soaps on the meningococcus, the gonococcus, and several organisms of the intestinal group.

The meningococcus was killed in 2½ minutes by 0.4 to 0.04 per cent and the gonococcus in the same length of time by 0.04 to 0.006 per cent solutions of the soaps of the fatty acids ordinarily present in soaps. Similar results were obtained with commercial soaps, indicating that the meningococci and gonococci will be readily killed by any ordinary soap if used with a reasonable degree of care. The dysentery and paratyphoid bacilli reacted like typhoid and colon bacilli in being completely resistant to the soaps of the unsaturated acids at ordinary temperatures, but nonresistant to moderate concentrations of the soaps of the saturated acids. Salt water soap prepared exclusively from coconut oil is considered to be the most readily available commercial soap to be used against these organisms.

Oiled slicker clothing M. Doniger (*Textile World, 68 (1925), No. 26, pp. 45, 47, 49, fig. 1*).—A general description is given of the principles involved and the methods employed in the manufacture of oiled slicker clothing and of the causes of deterioration of the material.

MISCELLANEOUS

Work and expenditures of the agricultural experiment stations, 1924, E. W. Allen, W. H. Beal, E .R. Flint, et al. (*U. S. Dept. Agr., Off. Expt. Stas., Work and Expend. Agr. Expt. Stas., 1924, pp. 114*).—This report contains a discussion of the activities of the stations during the fiscal year ended June 30, 1924, noted editorially (E. S. R., 54, p. 301); a résumé entitled Some Results of Station Work; four special articles noted elsewhere in this issue; a list classified by subjects of the publications of the stations received during the year; and Statistics of the Stations, by J. I. Schulte.

Some new developments in agricultural science: One year's work [at the Missouri Station], July 1, 1924, to June 30, 1925, F. B. Mumford et al. (*Missouri Sta. Bul. 236 (1926), pp. 90, figs. 14*).—This contains the organization list, a report of the director on the work and publications of the station, and a financial statement for the Federal funds for the year ended June 30, 1925. The experimental work reported is for the most part abstracted elsewhere in this issue.

Thirty-fifth Annual Report of [Wyoming Station, 1925], J. A. Hill (*Wyoming Sta. Rpt. 1925, pp. 71–98*).—This contains the organization list, a financial statement for the fiscal year ended June 30, 1925, a report of the director on the work of the station, and meteorological observations by F. E. Hepner (see p. 712). The experimental work reported is for the most part abstracted elsewhere in this issue.

NOTES

Arizona University and Station.—*Arizona Agriculturist* announces the appointment of William G. McGinnies as grazing range specialist to begin work next December.

Cornell University.—The Laura Spelman memorial fund given by the Rockefeller Foundation for studies in child training has been increased in amount. Started as a permanent annual appropriation of $13,000 for four years, with an additional $7,000 for the first year, the fund has been increased to $30,000 for this work during the year of 1926–27 and $23,000 for the third and fourth years.

Leaves of absence during the year 1926–27 have been granted several members of the staff of the College of Agriculture. Among these, Dr. G. F. Heuser will aid in establishing vocational training in poultry husbandry at a new type of school at Dartington Hall, Totnes, in England. This school is under the direction of Leonard K. Elmhirst, who since his graduation from Cornell University in 1921 has spent some time in India as director of a school for rural reconstruction.

Dr. E. L. Palmer of the department of rural education will conduct a nation-wide survey of the progress in nature study under the auspices of the American Nature Study Association, Dr. Charles Chupp will investigate vegetable diseases at Rutgers University, and L. H. MacDaniels of the pomology department will make a study of tropical fruit growing. F. G. Behrends of the rural engineering department will engage in graduate study at Columbia University.

New York State Station.—Raymond C. Bender, assistant in research (chemistry), has tendered his resignation, effective August 1, to accept a position as analyst for the department of animal industry of Cornell University.

Pennsylvania College.—The Pennsylvania State Grange is endeavoring to raise by subscription $250,000 for a girls' memorial dormitory. About $28,000 has already been deposited with the college treasurer for the purpose, and it is hoped that each grange in the State will contribute an amount equal to $2 for each member.

South Dakota College and Station.—According to a note in *Kansas Agricultural Student*, Lynn Copeland, assistant professor of dairy husbandry and assistant dairy husbandman, has accepted a position as head of the American Jersey Cattle Club, beginning September 1.

Utah College and Station.—Dr. Ira M. Hawley, professor of zoology and entomology and station entomologist, has resigned to accept a position with the Bureau of Entomology, U. S. D. A., with headquarters at Salt Lake City, where he will devote full time to a study of the alfalfa weevil. Dr. H. J. Pack succeeds Dr. Hawley as station entomologist. George Knowlton has been appointed assistant entomologist and assigned to the sugar beet leafhopper problem, which is being investigated cooperatively by the Utah and Idaho Stations and the Bureau of Entomology.

Dr. Carrie C. Dozier, professor of home economics, has been assigned to a study of factors affecting penetration of ultra-violet rays of the sun through animal and vegetable fibers. R. J. Becraft, assistant in range management, has been granted leave of absence to pursue ecological studies at the University of Chicago. W. P. Thomas has been appointed special research worker in marketing, effective July 1.

Virginia Station.—The State Crop Pest Commission has been abolished, its personnel becoming members of the station staff on July 1.

West Virginia University.—Dr. George R. Lyman, dean of the College of Agriculture since 1923 and widely known among plant pathologists, died at Johns Hopkins University Hospital, Baltimore, Md., on June 7 after an illness of many months.

Dr. Lyman was born at Lee Center, Ill., on December 1, 1871. He was graduated from Beloit College in 1894 and received from Harvard University the A. M. degree in 1899 and the Ph. D. degree in 1906. He served as instructor and assistant professor in botany at Dartmouth College from 1901 to 1913, as pathological inspector in the Federal Horticultural Board from 1913 to 1917, and as pathologist in charge of the plant disease survey of the U. S. Department of Agriculture from 1917 to 1922. He was also secretary-treasurer of the American Phytopathological Society from 1919 to 1922 and president in 1923, a member of the War Emergency Board of American Plant Pathologists in 1918, and chairman of its advisory board in 1919–20.

Wisconsin University and Station.—A series of field trials is under way by the department of agricultural bacteriology in a study of inoculation and cross inoculation of many different legumes. Several hundred rows of legumes under various treatments will be used. Many of the plants are of rare species and obtained from foreign lands.

The annual feeders' demonstration at the College of Agriculture was held May 22. At this meeting feeding experiments conducted during the past year with different classes of beef animals were reviewed, and livestock was shown at the stock pavilion on a variety of other experiments. Among these are feeding trials with 2-year-old steers comparing alfalfa with clover hay as a supplement to corn and corn silage for fattening, yearling cattle that have been fed with cottonseed meal as compared with linseed meal, and several trials with swine and sheep.

H. R. Stiles, research assistant in bacteriology, has resigned to engage in commercial work.

Home Economics Essay Contest.—A prize of $100 has been offered by the Rumford Historical Association, Woburn, Mass., in cooperation with the American Home Economics Association, for the best essay on the subject of Count Rumford and His Contribution to Home Economics. The essays are to consist of a historical review of not more than 4,000 words of those of Rumford's essays which are of interest to home economics workers and a list of possible present-day researches in the home economics field growing out of a consideration of Rumford's investigations. The contest is to close October 1 and is to be open to all. Additional information may be obtained from the Editorial Office, *Journal of Home Economics*, Mills Building, 700 Sexveneenth St., N. W., Washington, D. C.

Agricultural Education and Research in Siam.—A letter recently received from Dean H. L. Russell of the University of Wisconsin, who has been making a study of agricultural education and research in the Orient under the auspices of the International Education Board, gives numerous details regarding progress in Siam.

Dean Russell states that agricultural matters in Siam are under the control of the Minister of Lands and Agriculture. The agricultural department is located at Krom Paw Plook, about 40 miles from Bangkok. A farm is available, and the work of the department is mainly variety testing of rice. There is also an independent Bureau of Agricultural Science headed by Major W. R. S. Ladell, its principal function consisting of the analysis of fertilizers and soils.

A well-organized department of forestry is maintained under the chief conservator of forests, Phya Damphan Bitaks.

Near East Agricultural Survey.—According to a note in *Science*, Dr. O. S. Morgan, professor of agriculture at Columbia University, is to conduct an agricultural survey in Greece, Syria, Palestine, Armenia, and Turkey as advisory director of the agricultural, educational, and reconstruction work of the overseas staff of the Near East Relief. It is expected that the survey will be completed by the end of the year.

World Forestry Congress.—For the following account of this congress, the *Record* is indebted to W. N. Sparhawk, of the Forest Service:

About 30 foresters from the United States attended this congress, which was held at Rome, April 29 to May 5, following the General Assembly of the International Institute of Agriculture. The congress was sponsored by the institute and the Italian Government, as a result of a resolution adopted by the general assembly of 1924. Some 800 delegates from 60 countries were enrolled, although not all were in attendance.

About 250 papers were presented, dealing with various phases of silviculture, forest utilization, forest policy and legislation, and forestry education and research. There was also a special section devoted to forestry in the Tropics. Excursions were made to the State Forest School and Experiment Station at Florence and the State Forest of Vallombrosa and to the forest nurseries and reforestation projects near Naples.

Among others, resolutions were adopted urging the extension of public forests and public action to increase the production of private forests, restriction of grazing on forest and mountain lands and its regulation by foresters, research by forest experiment stations on problems of forage production and range improvement, research in forest genetics, international cooperation in assuring adequate supplies of dependable tree seed at reasonable prices, and the regulation of burning and of shifting cultivation in tropical countries. The International Institute of Agriculture was requested to collect and disseminate information on the appearance and spread of forest diseases and insect pests, and on methods of forest fire prevention and control. It was also asked to prepare for the next forestry congress a summary of existing forest taxation policies and of legislation dealing with public assistance to and regulation of private forestry.

One of the most important recommendations was the project for an international bureau of forestry statistics, which it is proposed to establish at the institute provided the necessary funds can be raised. This bureau will seek to obtain from the individual countries fairly comparable statistics on forest resources, production, consumption, and trade, and will combine, correlate, and publish the results. Such information will not only be exceedingly useful to all countries and industries concerned in international timber trade, but should also be of great value to each country in formulating its forestry policy.

The International Institute was asked to call the next congress in 1929 or 1930 in some tropical country to be selected later.

New Journals.—*Plant Physiology* is being published quarterly by the American Society of Plant Physiologists. In addition to notes, the initial num-

ber contains the following articles: Effects of Correlation between Vegetative and Reproductive Functions in the Tomato (*Lycopersicon esculentum* Mill.), by A. E. Murneek; The Extraction of Plant Tissue Fluids and Their Utility in Physiological Studies, by R. Newton, W. R. Brown, and W. M. Martin; Some Observations on the Growth of Yeast, by E. I. Fulmer; Sulphur in Rainwater, by S. V. and J. H. Eaton; A Plant Photometer, by E. S. Johnston; and Scientific Publication, by C. A. Shull.

Archives of Pathology and Laboratory Medicine is being published monthly by the American Medical Association "to serve the growth and to promote the spread of scientific knowledge of the nature and causes of disease as the basis for rational and successful methods of prevention and treatment." It will contain articles on the results of new work in all departments of pathology, general reviews, technical notes and descriptions of new and modified laboratory methods, matters of significance in the medicolegal application of pathology, abstracts of current pathological literature, reports of meetings, news notes, etc.

Protozoology, a supplement to the *Journal of Helminthology*, has been established by the Institute of Agricultural Parasitology, London School of Hygiene and Tropical Medicine, to provide for the occasional publication of original communications on the parasitic protozoa arising out of the work of the institute. The initial number includes articles entitled A Giardia Parasitic in a Bursate Nematode Living in the Viscacha, by J. G. Thomson; Observations on *Gastrocystis gilruthi*; and A Parasite of Sheep in Britain, and Observations on Two New Species of Coccidia Parasitic in Snakes, both by M. J. Triffitt.

Archief voor de Koffie Cultuur has been established by the experiment stations in the Dutch East Indies which are studying the coffee industry as a medium for the publication of their findings. This will include the work on coffee carried on by the General Experimental Station of the Rubber Planters' Association at Medan on the East Coast of Sumatra; the Bezoeki Experimental Station at Jember, Java; the Malang Experimental Station at Malang, Java; the Mid Java Experimental Station at Salatiga; and the Rubber Experimental Station of West Java at Buitenzorg; as well as contribntions from workers under specific grants, employees of the department of agriculture, private companies, and planters. Abstracts and reviews will also be included. The original research will be published in the Dutch language, bnt it is announced that extensive abstracts in English will be provided. The initial number is largely devoted to an article entitled Three Years' Investigations of the Coffee Borer, by Dr. K. Friederichs.

The Journal of the American Dietetic Association is being published quarterly by the American Dietetic Association. Among the articles in the initial number are the following: Certain Tendencies of Modern Hospital Dietaries for Normal People, by R. Fitz and A. Lantz; Intelligence and Character in Relation to Food Habits, by H. Emerson; and Recent Developments in Vitamin Strncture, by W. G. Eddy. Abstracts from current scientific literature are also contemplated.

La Terra is an illustrated monthly review of Italian reclamation work. The initial number contains several articles dealing with drainage, irrigation, and other land reclamation problems.

Die Kranke Pflanze is a monthly published at Dresden by the Saxon Plant Protection Society. The initial number consists of an article by Dr. von Veltinghoff-Relsch on The Pine Moth, and several shorter articles.

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EXPERIMENT STATION RECORD

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RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

Colloid symposium monograph, [I], edited by J. H. MATHEWS (*Madison: Univ. Wis., Dept. Chem., 1923, [vol. 1], pp. 419, pls. 4, figs. 72*).—This volume contains nearly all of the papers presented at the First National Symposium on Colloid Chemistry, held at the University of Wisconsin, June 12–15, 1923. Attention is called to the papers on Colloid Chemistry Technique, by T. Svedberg; The Swelling of Protein Jellies, by J. A. Wilson; The Thermochemistry of Protein Behavior, by J. H. Mathews and B. W. Rowland; On the Theory of the Lyophilic Colloids and the Behavior of Protoplasm, by M. H. Fischer; The Colloid Chemical Problems in the Manufacture of Enzymic and Animal Glandular Products, by D. Klein; The Nature of the Chemical Reactions of Colloidal Clay, by R. Bradfield; and The Application of Colloid Chemistry to Some Agricultural Problems, by R. A. Gortner.

Colloid symposium monograph, [II], edited by H. N. HOLMES (*New York: Chem. Catalog Co., 1925, vol. 2, pp. VII+368, figs. 80*).—This volume is composed of the papers presented at the Second National Symposium on Colloid Chemistry, which was held at Northwestern University in June, 1924. Of the 20 papers, the following may be cited as of particular interest in this section: General Principles of the Effects of Ions in Colloids, by L. Michaelis; Theory of Adsorption and Soil Gels, by N. E. Gordon; The Rôle of Colloids in Soil Moisture, by G. J. Bonyoucos; The Supercentrifuge, by L. H. Clark; Bacteria as Colloids, by A. I. Kendall; The Effect of Ammonium Salts upon the Swelling of Colloids and upon the Growth of Yeast at Various Temperatures, by E. I. Fulmer; and Physico-chemical Studies on Proteins.—I, The *Prolamines—Their Chemical Composition in Relation to Acid and Alkali* Binding, by W. F. Hoffman and R. A. Gortner, which is abstracted below.

Physico-chemical studies on proteins.—I, The prolamines—their chemical composition in relation to acid and alkali binding, W. F. HOFFMAN and R. A. GORTNER (*In Colloid Symposium Monograph, [II]. New York: Chem. Catalog Co., 1925, vol. 2, pp. 209–368, figs. 20*).—This contribution from the Minnesota Experiment Station consists of the report of an extensive investigation of the physicochemical properties of a single type of proteins, the prolamines, or alcohol-soluble proteins of the cereals.

The literature on the preparation and analysis of various prolamines and on the binding of acids and alkalies by these proteins is first reviewed. The prolamines already studied, together with certain ones not hitherto isolated or examined, were prepared and analyzed for nitrogen, carbon, hydrogen, moisture, organic sulfur, and nitrogen distribution and examined for comparative acid

and alkali-binding capacities. For purposes of comparison, casein and fibrin were also prepared and analyzed. The sources of the prolamines examined and their proposed nomenclature are as follows: *Triticum vulgare*, gliadin; *T. spelta*, speltin; *T. durum*, durumin; *T. dicoccum*, dicoccumin; *T. monococcum*, monococcumin; *Secale cereale*, secalin; *Avena sativa*, sativin; *Hordeum vulgare*, hordein; *Zea mays*, zein; teosinte, teozein (E. S. R., 53, p. 802); kafir, kafirin; and sorghum, sorghumin.

No striking differences between the prolamines studied could be detected from their elementary analyses. In regard to nitrogen distribution, free amino nitrogen, free carboxyl groups, ammonia nitrogen, tryptophane and cystine, there appeared to be a close similarity between the proteins of a single group, such as the wheat group and maize group, but a distinct difference between the proteins from different types. These differences, however, were not sufficiently marked to make possible a sharp subdivision into classes.

In testing the binding capacity for acids and alkalies, the potentiometric method was used. The chief interest in this part of the investigation was in the evidence furnished by the data obtained as to whether the union of proteins with acids and alkalies is a chemical type of combination, as emphasized by Loeb (E. S. R., 54, p. 108), or an adsorption type of combination. Evidence on both sides is summarized as follows:

"Evidence of a chemical type of combination between a hydrogen ion concentration of pH 2.5 and pH 10.5 is presented by: (1) The logarithms of the amount of acid or alkali bound plotted against the original concentrations do not form a straight line. (2) The buffer curves do not form a smooth, regular line. (3) The amount of acid or alkali bound at any hydrogen ion concentration between pH 2.5 and pH 10.5 depends on the chemical composition of the protein. This is not true where the pH is less than 2.5 or greater than 10.5. (4) When the hydrogen ion concentration is below about pH 2.5, the protein chloride is highly ionized.

"Evidence of the adsorption type of combination is furnished by: (1) At the higher concentrations of acid and alkali, all of the proteins used in this work, regardless of their chemical composition, bind approximately the same amount of acid or alkali. (2) There is a marked negative temperature coefficient of the acid or alkali binding at the higher concentrations of acid and alkali. (3) The logarithms of the amount of acid or alkali bound plotted against the logarithms of the original acid or alkali concentration or against the final pH form a straight line. (4) There is more alkali bound when the original concentration is 0.500 normal than can be accounted for by chemical combination assuming that there is an available carboxl group for each nitrogen atom, an assumption far in excess of possibility. (5) When the hydrogen ion concentration is greater than about pH 2.5 there is no increase in the ionization of the protein chloride."

In commenting upon the data, the authors express the opinion that the isoelectric point of a protein probably is not a definite point but rather an isoelectric range. The position of this range on the pH scale depends on the chemical composition of the protein, but the calculated isoelectric points are considered to be unrelated to the chemical composition of the protein.

An extensive bibliography is appended.

The binding of acid and alkali by proteins, R. A. GORTNER and W. F. HOFFMAN (*Science, 62 (1925), No. 1612, pp. 464–467*).—A summary of the above.

Colloid symposium monograph, [III], edited by H. N. HOLMES and H. B. WEISER (*New York: Chem. Catalog Co., 1925, vol. 3, pp. 323, pls. 2, figs. 108*).—This volume contains the 22 papers which were presented at the Third National Symposium on Colloid Chemistry held at the University of Minnesota,

June 17-19, 1925. Of particular interest in this section are the following papers: The Colloid Chemistry of Rennet Coagulation, by L. S. Palmer and G. A. Richardson; The Colloid Chemistry of Protoplasm, by L. V. Heilbrunn; The Effect of Surface Tension Depressants upon Bacterial Toxins, by W. P. Larson, H. O. Halvorson, R. D. Evans, and R. G. Green; Physico-Chemical Studies of the Mechanism of Blood Clotting, by I. N. Kugelmass; The Effect of Anions upon the Physical, Chemical, and Colloidal Properties of Aluminium Hydroxide, by L. B. Miller; Nature of the Colloidal Soil Material, by P. L. Gile; The Colloid Chemistry of Soils, by E. Truog; and The Power of Soils to Absorb Water from Air, by F. J. Alway.

Variations in the chemical composition of cabbage and sauerkraut, W. H. Peterson, E. B. Fred, and J. A. Viljoen (*Canner, 61 (1925), No. 4, pp. 19–21, fig. 1*).—Nineteen samples of five varieties of cabbage grown in four States and gathered at different periods of maturity were analyzed for moisture, sugar, total and insoluble nitrogen, and calcium. The bulk of the cabbage from which these samples were taken was then made into sauerkraut and the kraut analyzed for fermentation products, total, soluble, and amino nitrogen, and moisture.

Great variations were shown in the composition of the cabbage, both with the variety and maturity. Sugar varied from 3 to 4.2 per cent, total nitrogen from 0.15 to 0.24, soluble nitrogen from 0.06 to 0.16, and calcium from 0.034 to 0.057 per cent. The sugar tended to decrease, the nitrogen to increase, and the calcium to remain constant with increasing maturity.

Data on the fermentation products in the sauerkraut prepared from seven samples of the cabbage showed ranges in moisture content of from 89.6 to 91.5, sugar from 0.09 to 0.77, titratable acid as lactic from 1.44 to 1.93, volatile acid as acetic from 0.28 to 0.42, nonvolatile acid as lactic from 1.13 to 1.52, and ethyl alcohol from 0.29 to 0.61 per cent. A comparison of the nitrogen content of eight samples of kraut with corresponding samples of juice showed both to have approximately the same composition, suggesting that kraut juice should be utilized and not discarded as is customarily done. The averages for the total and soluble nitrogen in the cabbage and kraut were almost identical, but the amino nitrogen content of the kraut was about 50 per cent higher than that of the cabbage.

It is concluded that variations in the composition of the cabbage must be a factor in determining the quality of the resulting sauerkraut, but that more work is needed to indicate what composition is most favorable for the growth of sauerkraut bacteria and the production of kraut of the best quality.

Variations in the mineral content of cabbage and sauerkraut, W. H. Peterson, C. A. Elvehjem, and L. A. Jamison (*Soil Sci., 20 (1925), No. 6, pp. 451–457*).—In addition to data on the composition of cabbage and sauerkraut noted above, analyses of the same samples for phosphorus and iron are reported.

In the original samples of cabbage the phosphorus varied from 0.017 to 0.037 per cent, with an average of 0.024 per cent, and iron from 0.00017 to 0.00059 per cent, with an average of 0.0003 per cent. In sauerkraut the corresponding values were 0.016, 0.034, and 0.026 per cent for phosphorus and 0.00028, 0.00072, and 0.00047 per cent for iron. There appeared to be a relationship between the calcium and iron in the different samples but none between calcium and phosphorus.

The odorous constituents of the cotton plant.—Emanation of ammonia and trimethylamine from the living plant, F. B. Power and V. K. Chesnut (*Jour. Amer. Chem. Soc., 47 (1925), No. 6, pp. 1751–1774*).—An extensive investigation of the concentrated distillate from the cotton plant, prepared

essentially as described by Vieboever, Chernoff, and Johns (E. S. R., 39, p. 411) and containing all of the odorous and volatile constituents of the plant, is reported from the Bureau of Chemistry, U. S. D. A. The individual substances isolated are summarized as follows: Methyl alcohol in large amount, with traces of acetone; amyl alcohol in relatively small amount, together with small amounts of higher homologues; acetaldehyde and traces of an aldehyde of higher carbon content; a very small amount of vanillin; traces of a phenol similar in its properties to *m*-cresol; an optically inactive dicyclic sesquiterpene and a new optically active tricyclic sesquiterpene; a small amount of a paraffin hydrocarbon melting at 62° C. and thought to be triacontane, $C_{30}H_{62}$; a blue oil probably containing the highly unsaturated hydrocarbon, azulene, $C_{15}H_{18}$; formic, acetic, and caproic acids; and ammonia and trimethylamine in appreciable amounts.

Some nitrogenous constituents of the juice of the alfalfa plant.—VI, Asparagine and amino acids in alfalfa, H. B. VICKERY (*Jour. Biol. Chem., 65 (1925), No. 3, pp. 657–664*).—Continuing the investigation previously noted (E. S. R., 54, p. 408), the precipitate obtained with Neuberg's reagent when working up alfalfa filtrate for the betaine fraction was subjected to protein analysis with the following results:

"Asparagine, aspartic acid, tyrosine, phenylalanine, serine, leucine, valine, and alanine were isolated. These substances make up at least 29.5 per cent of the solids of the fraction and, together with the ammonia set free by hydrolysis, 54.8 per cent of the nitrogen. The aspartic acid obtained after hydrolysis propably represents asparagine. At least 55 per cent of the amide nitrogen of the amino acid fraction is accounted for as asparagine, and the aspartic acid found after hydrolysis indicates that more of this substance is present. Although no other amide has yet been found, it is probable that other substances yielding ammonia on mild acid hydrolysis are present in the juice of the alfalfa plant. Serine and alanine, so far as we can learn, have not previously been reported as occurring in plant juices. They were definitely identified as α-napthylhydantoic acid derivatives."

The preparation of raffinose from cottonseed meal, D. T. ENGLIS, R. T. DECKER, and A. B. ADAMS (*Jour. Amer. Chem. Soc., 47 (1925), No. 11, pp. 2724–2726*).—In the method described, cottonseed meal is extracted with methyl alcohol for 2 or 3 days in a continuous extraction apparatus differing somewhat from that described by Sando (E. S. R., 52, p. 503). The oil is removed from the extract by the addition of hot water and petroleum ether and other impurities by precipitation with basic lead acetate, care being taken to separate by washing with hot water the raffinose carried down with the lead precipitate. After the removal of the excess lead from the filtrate, the solution is filtered through Norit and concentrated under diminished pressure to a sirup containing about 70 to 80 per cent solids. From this the raffinose is crystallized out by the method of Hudson and Harding (E. S. R., 32, p. 711).

A further investigation of the chemical properties of insulin, D. A. SCOTT (*Jour. Biol. Chem., 65 (1925), No. 3, pp. 601–616*).—Insulin prepared by the method of Scott and Best (E. S. R., 53, p. 804) was subjected to the action of various reagents with a view to determining more definitely its chemical nature, particularly as to whether or not it is a protein.

Benzoyl chloride and carbon disulfide completely inactivated insulin in alkaline solution, but attempts to reactivate it by acid hydrolysis were unsuccessful. In acid solution at room temperature insulin was only slightly acted upon by formaldehyde, but it lost most of its potency at higher temperatures. In alkaline solution it was almost completely inactivated. Attempts to reactivate it by acid hydrolysis and by oxidation were unsuccessful. Insulin was

inactivated by nascent hydrogen, sulfur dioxide, calcium bisulfite, and nitrous acid, and all attempts to reactivate it were unsuccessful.

A very pure insulin product was prepared from insulin obtained by the above-noted method of Scott and Best by dissolving it in a small quantity of acid water, adding a concentrated solution of trichloroacetic acid to a concentration of 3 per cent, centrifuging the protein precipitate, dissolving it in acid water, adjusting the pH to 6.2, filtering off the small amount of precipitate which settled out in standing, adjusting the liquid to pH 3.7, centrifuging off the precipitate, and adjusting the supernatant liquid to pH 5. The precipitate which formed at this point was dissolved in 50 per cent alcohol, and from the solution the insulin was precipitated out as a snow-white powder by the addition of 20 volumes of acetone. This powder, which assayed 25,000 units per gram, had a nitrogen content of 0.006 mg. per unit of activity and in solutions containing 100 units per cubic centimeter showed characteristic protein reactions, a faint color reaction for tryptophane, negative Molisch and orcein tests, and no phosphorus. Two combustion analyses gave the following results: Carbon 50.76 and 50.03, hydrogen 6.57 and 6.66, nitrogen 14 and 14, and ash 0.4 and 0.4 per cent. The distribution of nitrogen in the two samples was ammonia 9.6 and 9.8 per cent, humin 0.4 and 0.4, arginine 10 and 10, histidine 5.2 and 4.7, lysine 4.8 and 5.4, cystine 0.5 and 0.6, total bases 20.5 and 20.5, total filtrate 67 and 68.4, amino nitrogen of filtrate 64.2 and 66.2, and nonamino nitrogen of filtrate 2.8 and 2.2 per cent.

From the combined data the conclusion is drawn that there is an apparent similarity between insulin and protein, but that further research is necessary to determine whether or not the purified product contains two or more proteins of similar physical properties.

Concentration of the growth-promoting principle obtained from yeast (vitamin B), P. A. Levene and B. J. C. van der Hoeven (*Science, 62 (1925), No. 1617, p. 594*).—This is a brief note to the effect that a further concentration of the vitamin B-containing fraction of yeast extract has been effected by adjusting the reaction of the aqueous extract to pH 4, precipitating the active material with alcohol, treating a solution of this material with nitrous acid, and finally absorbing the active material with silica gel and separating it from the silica gel at pH 9.5. The final material is said to contain 4 per cent of sulfur and to furnish sufficient vitamin B for the growth of rats in daily doses of 0.00008 gm.

Proline and tryptophan as factors influencing the accuracy of Van Slyke's method for the determination of nitrogen distribution in proteins, R. A. Gortner and W. M. Sandstrom (*Jour. Amer. Chem. Soc., 47 (1925), No. 6, pp. 1663–1671*).—The Van Slyke method of determining the distribution of nitrogen in proteins was tested on three artificial mixtures of 14 amino acids (not including tryptophane or proline) before and after boiling for 24 hours in the presence of hydrochloric acid, both in the presence and absence of proline and tryptophane, respectively.

In the absence of tryptophane and proline and without previous boiling, the results obtained confirmed the original work of Van Slyke, but those obtained after boiling showed that approximately 35.5 per cent of the cystine nitrogen was not precipitated by phosphotungstic acid, resulting in a corresponding loss in the amino nitrogen of the bases. There was a gain in the ammonia nitrogen but no other differences greater than could be attributed to the experimental errors of the method.

Following the addition of tryptophane but not proline, the analysis of the unboiled samples showed appreciable errors in the basic fraction (chiefly in the arginine and in the amino and total nitrogen) of the filtrate from the

bases. The analysis of the boiled mixture in the presence of tryptophane showed errors in the histidine and cystine fractions of the bases, in the ammonia fractions, and in the filtrate from the bases. The addition of proline caused errors in the unboiled mixture, both in the basic fraction and in the fractions in the filtrate from the bases. Similar results were obtained with the boiled mixture containing proline and, as in the case of tryptophane, cystine was only partially precipitated and ammonia nitrogen was increased. It is concluded that both tryptophane and proline produce errors in the Van Slyke nitrogen distribution, and that the cystine value of the Van Slyke analysis on a 24-hour protein hydrolysate represents approximately 65 per cent of the true cystine nitrogen present in the unboiled material.

A method for the determination of total sulfates in tissues, W. DENIS and S. LECHE (*Jour. Biol. Chem., 65 (1925), No. 3, pp. 561–563*).—The method described consists essentially in digesting the finely minced tissue by heating with dilute hydrochloric acid in an autoclave, removing the undissolved material by centrifuging followed by filtering with suction through a Gooch crucible, and finally precipitating the sulfate with barium chloride and determining it gravimetrically. A study of the behavior of cystine under the conditions of the experiment indicated that no cystine sulfur is changed into sulfate during the determination.

The sugar content of blood, B. K. HARNED (*Jour. Biol. Chem., 65 (1925), No. 3, pp. 555–560*).—A method of determining blood sugar is described in which the blood proteins are precipitated by a slight excess of acid mercuric nitrate, the excess of mercury and the unoxidized nitrogen are removed from the filtrate by successive precipitations with sodium bicarbonate and hydrogen sulfide, and the final filtrate is substituted for the tungstic acid filtrate in the Folin-Wu method. The technique of the procedure is described in detail, and comparative values are reported for several blood sugar determinations by the original Folin-Wu method, the new Benedict method (E. S. R., 54, p. 10), and the present method. In the entire series of 28 samples a close agreement was obtained between the last two methods, while the results by the Folin-Wu method averaged from 17 to 25 per cent higher.

In commenting upon the procedure, it is noted that glucose added to the blood is quantitatively recovered, the final filtrate is free of unoxidized nitrogen, and sodium nitrate added to a sugar standard in amount equal to the maximum concentration possible in a blood filtrate from the mercuric nitrate procedure has no effect upon the color value of the standard in the Folin-Wu method. The procedure is not recommended as a routine method on account of the exacting technique involved, but is advocated when it is desirous of obtaining the absolute concentration of glucose in the blood.

Identification of Norit and other wood charcoals, H. G. TANNER (*Indus. and Engin. Chem., 17 (1925), No. 11, pp. 1191–1193, figs. 12*).—By means of microscopic examination and comparison with charcoals prepared from various woods, the commercial decolorizing carbon Norit has been proved beyond reasonable doubt to be made from birch wood, probably the species *Betula occidentalis*. The process used is thought to be the reduction of the wood sawdust in the presence of a limited amount of air, followed by acid extraction, washing, and drying. Photomicrographs are given of charcoals from various woods showing striking differences in perforations such as made possible the identification of Norit.

Fundamental principles of detergent action revealed by the graphite test, R. M. CHAPIN (*Indus. and Engin. Chem., 17 (1925), No. 11, pp. 1187–1191, figs. 10*).—The author presents a theory of deflocculation and detergency in soap

solutions, and illustrates it experimentally by the use of the graphite test for detergent efficiency previously described (E. S. R., 54, p. 8).

METEOROLOGY

Our weather: What makes it and how to watch it, C. F. TALMAN (*New York: Reynolds Pub. Co., [1925], pp. 384, pls. 21, figs. 35*).—This is a reprint, with changed title, of Meteorology: The Science of the Atmosphere, previously noted (E. S. R., 50, p. 313).

The application of meteorology to the astronomical cycle of 744 years [trans. title], GABRIEL (*Compt. Rend. Acad. Sci. [Paris], 181 (1925), No. 4, pp. 187–189*).—A study of the available data is held to indicate a certain parallelism between the astronomical cycle and the general circulation of the earth's atmosphere, with some resultant effects on weather periodicity.

Provisional solar-constant values, August, 1920, to November, 1924, C. G. ABBOT ET AL. (*Smithsn. Misc. Collect., 77 (1925), No. 3, pp. 38, figs. 2*).—The weighted means and grade as to reliability of daily observations at Harqua Hala, Ariz., and Montezuma, Chile, are given with decade mean values of the solar constant and monthly means of daily differences at the two stations. "From the march of these data the reader may perceive that a very pronounced depression of solar constant values has occurred since March, 1922, but that we may be now returning towards a condition of higher ones. This state of affairs is not, indeed, surprising, because we have recently passed through the minimum of sun spots and are now to expect greater solar activity." The need of additional observing stations is pointed out.

Climatological studies.—VI, Relations between humidity of the climate and vegetation [trans. title], D. SZYMKIEWICZ (*Acta Soc. Bot. Polon., 3 (1925), No. 1, pp. 115–137, pls. 6, figs. 3*).—This article reports the results of a study of the relation of humidity to forest growth in North America, exclusive of Mexico.

A study of the climate of Greece, E. G. MARIOLOPOULOS (*Étude sur le Climat de la Grèce. Paris: Presses Univ. de France, 1925, pp. 66, figs. 6*).—Two subjects are dealt with, precipitation and stability of the climate of Greece within historic times, with special reference to the southern part of the country. The geographic distribution of rainfall is shown to be very irregular, the average annual precipitation ranging from 400.8 mm. (15.79 in.) in Piraeus to 1,216.8 mm. in Corfu. The year is divided into wet (winter) and dry (summer) seasons, the rainfall varying from as low as 32 mm. in summer in Syra in the eastern archipelago to 395.2 mm. in winter in Argostoli in the west. The rains tend to be intense and not prolonged. Hail is relatively frequent in winter in the southern and western parts of the country.

From a comparison of ancient records not only of weather phenomena but of phases of vegetation and cultural practice, particularly with reference to wheat culture, the author finds no convincing evidence of permanent change in the climate during the last 27 centuries.

Phenological observations and results in Russia, P. J. SCHMIDT (*Nature [London], 117 (1926), No. 2934, pp. 119, 120, figs. 2*).—The history of the development and present status of phenological observations in Russia is briefly reviewed, showing that beginning with the work of N. Annenkoff in Moscow in 1844 and continued by A. Doërgingk in Kishinev, A. Voeikoff, and D. N. Kaigorodoff, as well as by the phenological committee of the Russian Society of Amateurs of the Study of the Universe, there has been developed a system of observation which, in 1925, included 608 observers at 512 places in

European Russia besides observations at 58 places in the Ukraine. At about 75 places in European Russia, observations have been made for 10 to 20 years, and a table of the mean times of occurrence of different natural phenomena at 17 typical centers in the country has been drawn up. The existing network of observing stations is considered sufficiently large to yield results of great general interest, but it is pointed out that "incomparably more generalized and more interesting results could be obtained from the phenological observations if they were conducted in the same manner and with the same objects also in western Europe, so that diagrams could be traced covering the whole continent." The organization of an international congress of phenology or of a special section of phenology at the next International Meteorological Congress is suggested.

The great drought problem of South Africa, I–VIII (*Union So. Africa Dept. Agr. Jour., 11 (1925), Nos. 1, pp. 22–29, fig. 1; 2, pp. 109–112; 3, pp. 209–214; 4, pp. 324–337, fig. 1; 5, pp. 391–395; 12 (1926), Nos. 1, pp. 33–37; 2, pp. 111–119*).—Reviewing the literature and observations on the subject, the conclusion is reached that the drought situation is an accumulative evil, the bad effects of which, especially soil erosion, are aggravated by the kraaling system of concentrating stock at night at certain fixed places. The available records indicate no falling off in total rainfall, but the increasingly injurious effects of drought are attributed to failure to conserve properly the available supply. It is suggested that conditions may be improved by giving more attention to the culture of drought resistant crops, substituting paddocking for kraaling, eliminating overgrazing, growing supplementary feeds, planting windbreaks, protecting plant cover to reduce erosion, providing more frequent and abundant watering places, stopping veld burning, and promoting education and improved transportation. The value of a reliable means of seasonal forecasting of rainfall is pointed out.

Climatological data for the United States by sections, [November–December, 1925] (*U. S. Dept. Agr., Weather Bur. Climat. Data, 12 (1925), Nos. 11, pp. [188], pls. 3, figs. 2; 12, pp. [192], pls. 4, fig. 1*).—These numbers contain brief summaries and detailed tabular statements of climatological data for each State for November and December, 1925.

Climatological data for the United States by sections, [1925] (*U. S. Dept. Agr., Weather Bur. Climat. Data, 12 (1925), No. 13, pp. [233], pls. 15, figs. 12*).—This number summarizes the climatological data for each month of 1925 and for the year as a whole for each State.

SOILS—FERTILIZERS

[Soil studies at the Washington Station] (*Washington Col. Sta. Bul. 196 (1925), pp. 38–41*).—A continuation of studies on the maintenance of organic matter in eastern Washington soils by F. J. Sievers and H. F. Holtz (E. S. R., 52, p. 814) led to the conclusion that in any system of practical agriculture it is impossible to maintain the soil organic matter content at the point at which it was found in the virgin state. The only exception to this rule is under conditions where arid soils are brought under irrigation and are then farmed under what virtually amounts to changed climatic conditions.

It is reported that there is a definite relationship between the organic nitrogen and carbon in the soil, which has a tendency to maintain itself under natural conditions with the result that the effective organic matter in the soil can not be increased or even maintained unless the nitrogen is also increased or maintained. When organic matter is lost from the soil as a result of decomposition encouraged by agricultural practices the carbon is lost more

rapidly than the nitrogen, and the remaining organic matter becomes more and more resistant to decay as its nitrogen content increases above the percentage present in the virgin state.

Crop residues like straw which are low in nitrogen content have a depressing influence on nitrate accumulation and on yield when first applied to a soil. This effect is overcome only after the residue has decomposed to a point where enough carbon has been lost to bring the carbon-nitrogen ratio to about 11 : 1, at which point it is apparently very stable. Organic materials, when applied to the soil for the purpose of increasing the desirable and effective organic matter, are beneficial in proportion to their nitrogen content.

The distribution of organic matter in the soil is influenced in a very pronounced degree by the soil reaction. An alkaline soil solution tends to dissolve the organic matter and distribute it through a greater depth of soil, while an acid soil solution precipitates the organic matter and thus prevents it from leaching into the subsoil.

The effective organic matter in the soil found under cropped conditions has practically the same carbon-nitrogen ratio as have bacteria. It is the contention that all organic matter applied to the soil needs to pass through this bacterium stage before it really becomes of much value or reaches that stable composition in which most of it exists.

Studies by A. F. Heck on the fixation and distribution of nitrogen and organic matter by legumes in Palouse silt loam soils showed that for the first year the weight of the root and stubble of alfalfa to a depth of 6 in. exceeded the weight of the total top growth. With red clover the root and stubble to a depth of 6 in. was only a little more than one-half, and in the case of sweet clover only a little more than one-third, that of the tops.

Studies by Sievers and Holtz on plant composition as influenced by variations in soil type showed that the total phosphorus content of the 57 samples of soil examined was very high and the available phosphorus content very low. The total calcium content was high, and none of the calcium was present in the carbonate form. The phosphorus and calcium contents of oats grown on these soils were exceedingly low. The contents of the materials in red clover were also less than those reported by other stations.

The high phosphorus and calcium requirements of red clover made it difficult and frequently impossible to grow such crops with any assurance of success. It is suggested that possible nutritional disorders of dairy cattle may be associated with the low phosphorus and calcium contents of the feed, and that they may, in large part, be overcome directly through systems of soil management that will make it possible or less difficult to produce legume hays.

[Tillage, soil moisture, and soil organic matter problems at the Adams Substation], H. M. WANSER and I. M. INGHAM (*Washington Col. Sta. Bul. 196 (1925), pp. 48, 49*).—Data on the effect of tillage and consequent soil moisture variation on the yield of different crops are briefly presented. Studies on soil organic matter maintenance (E. S. R., 52, p. 815) showed that the tendency of organic residues has been to depress the yield, especially of the straw, of winter wheat. The presence of a plentiful supply of available nitrogen was very noticeable in the early growth on soil to which alfalfa had been applied, and to a slightly less extent on soils to which sodium nitrate was applied.

Soil moisture investigations [at the Waterville Substation], C. E. HILL (*Washington Col. Sta. Bul. 196 (1925), pp. 56, 57*).—Studies are briefly reported which showed that the outstanding factors causing loss of moisture during the winter months in the Waterville area are snow drifting and loss of snow water due to run-off on frozen ground. The tract not plowed, but from which

the stubble was burned in the fall, had the lowest penetration of moisture. A comparison of this tract with the one having the stubble standing during the winter months showed a loss in penetration of 8.8 in. The ground which had stubble standing throughout the winter lost moisture by run-off, and the ground which was fall plowed lost moisture by snow drifting. As the moisture penetration in the two tracts was about equal in the spring, it is assumed that the loss by run-off from the stubble tract about equaled the loss by drifting from the fall plowed tract.

[**Soil and soil fertility studies in India, 1923–24**] (*India* [*Dept. Agr.*] *Rev. Agr. Oper., 1923–24, pp. 45–53*).—This report continues, in part, work previously noted (E. S. R., 52, p. 120). Some of the results reported have been noted from another source (E. S. R., 53, pp. 720, 721).

In connection with the investigation at Pusa on the method of estimating the amount of available phosphoric acid in calcareous soils, it has been found that the underlying principle of the action of potassium carbonate on calcareous soils is that a reaction takes place with dicalcic and such other acid phosphates as may be present in the soil, and that this leads to the production of insoluble tricalcic phosphates and soluble potassium phosphate. Hence the amount of phosphoric acid found in the extract is an approximate measure of the available phosphate in such calcareous soils.

Studies of the relation of the clay content of soils to their moisture adsorption at Pusa have shown that this relation is of the nature of a log-log curve. Studies of soil moisture conservation under only rain watered conditions at Gurdaspur in the Punjab have indicated that a deep mulch may contain a smaller quantity of moisture in the first 1 or 2 ft., and that there is always a greater store of water under a deep mulch than under a shallow one.

Further observations at Pusa on the conditions under which nitrogen fixation by nonsymbiotic organisms takes place in soils have shown that fermented rice straw gives larger yields of maize and of oats grown as a second crop than cattle manure.

It has been found that normal soils possess the power of rapidly fixing large quantities of nitrogen without the addition of any carbohydrate, and that under certain unknown conditions a loss of nitrogen can also take place rapidly. Light soils have been found to possess greater nitrogen-fixing powers than heavy soils and also to suffer less from denitrification. On the whole, however, nitrogen fixation has been found to occur more often than denitrification. The conclusion is drawn that after a soil has been exposed to the climate for several months subsequent to the removal of the wheat crop, it becomes suitable for nitrogen fixation.

As a result of further work on the activation of nitrification in cattle urine, two methods have been devised at Pusa for conserving its nitrogen content. The first consists in the passage of the diluted urine through a suitably prepared aerating filter bed of broken brick or rubble, resulting in the formation of nitrates and in the recovery of the major portion of the original nitrogen content of the urine in this form. In the second method soil prepared by previously nitrifying some nitrogenous material and washing out the nitrates is used for the absorption of urine. If untreated ordinary soil is used, nitrogen losses amounting to from 70 to 80 per cent of the original occur. It is estimated that in one year about 205 lbs. of potassium nitrate can be obtained from the urine of a single animal by this process of intensive nitrification, provided no loss of nitrogen takes place during handling.

Green manuring experiments at Pusa indicated that a crop of sunn hemp can be used both as a green manure and as a source of fiber by cutting off

and using the tops as manure and retaining the stalks. Further experiments on the activity of soil bacteria in providing available phosphate in the form of organic phosphorus, as a result of the interaction of a green manure and a phosphatic fertilizer, showed that on a quantitative basis bacteria in cultures, both pure and mixed, are able to take up large amounts of phosphoric acid from various sources, which is then stored in the form of organic compounds as a part of the bacterial cell. It was found that the inorganic phosphorus present in mono- and dicalcic phosphates, when composted separately with lucern, combined with the organic matter of the lucern and formed organic phosphorus compounds. Experiments made to ascertain the effect of small quantities of sulfur on green manuring with sunn hemp showed that in the case of wheat the addition of sulfur markedly increased the efficiency of the green manure, and gave a larger yield of seed and straw.

Experiments at Jamshedpur showed that a plat treated with 1,000 lbs. per acre of activated sludge and irrigated with the clear nonputrefactive effluent from an activated sludge disposal plant gave a yield of green oats which was 26 times that of the check plat and twice that of the plat which received 560 lbs. per acre of cattle manure.

In studies at Nagpur on the influence of the moisture content of black cotton soil on its ammonifying and nitrifying powers, a moisture content of from 24 to 30 per cent enabled this soil to attain maximum nitrification, and with the temperature fluctuating between 75 and 95° F. during the monsoon months from 50 to 60 per cent of nitrogen added in the form of oil-free sesamum cake was oxidized in two weeks. Studies of the decomposition of different cake manures under field conditions in the red soils of Bengal, conducted at Dacca, showed that with a moisture content kept more or less constant at between 14 and 16 per cent the nitrification of castor and mustard cakes was progressive for the first two months, at the end of which period it was 50 per cent. It then slowed down and after four months amounted to 56 and 55 per cent, respectively. Sesamum, safflower, and peanut cakes gave progressive figures of 58, 69, and 76 per cent, respectively. Further experiments at Pusa showed that the rapid and complete nitrification of bone manures could be obtained by fermenting them before applying to the soil.

Experiments at Pusa to ascertain the effect of sodium nitrate on a crop of wheat when applied at different stages of growth showed that irrigation to the extent of 2 in. did not influence the nitrogen content of the wheat. The application of sodium nitrate at any time up to 12 weeks after sowing resulted in an increase in the nitrogen content of the grain.

Experiments on the liming of red laterite soils in Bengal showed that the addition of lime above a certain maximum tends to throw potash out of solution. On treating a red soil solution with bone meal and lime, the further application of the latter tended to increase the phosphate in solution, but an increase in the quantity of bone meal seemed to decrease the lime in solution.

The stability of suspensions.—I, The rate of sedimentation of kaolin suspensions by salts at varying hydrogen ion concentrations, W. O. Kermack and W. T. H. Williamson (*Roy. Soc. Edinb. Proc.*, *45* (*1924–25*), *No. 1, pp. 59–70, figs. 17*).—Studies conducted at the Edinburgh and East of Scotland College of Agriculture are reported on the general question of the stability of colloidal suspensions, and more particularly on the stability of soil suspensions.

The rates of sedimentation of a kaolin suspension in the presence of varying concentrations of different salts were compared at different pH values. Sodium chloride increased the rate of sedimentation in alkaline solution, but actually inhibited it in an acid solution.

With concentrations of monocalcium phosphate above 0.06 per cent, abnormal sedimentation took place in an alkaline solution with the result that it was much more complete than at the corresponding concentrations in acid solution. In acid solution the trivalent ions aluminum, iron, and lanthanum had little effect, but a zone of very marked flocculation occurred at pH 7 to 8. This zone separated a region within which the unsedimented particles were negatively charged from a region within which they were positively charged.

Agrophysical methods of studying soils [trans. title], A. G. DOJARENKO (*Nauch. Agron. Zhur.* (*Jour. Landw. Wiss.*), *1* (*1924*), *No. 2, pp. 99–114, figs. 13*).—Methods of studying soils used by the Agricultural Academy of Moscow are described and illustrated.

Soil survey of Iowa—Hardin County, W. H. STEVENSON, P. E. BROWN, ET AL. (*Iowa Sta. Soil Survey Rpt. 38* (*1925*), *pp. 79, pl. 1, figs. 18*).—This survey deals with the soils of an area of 364,160 acres lying partly in the Wisconsin drift soil area and partly in the Iowan drift and southern Iowa loess areas in central Iowa.

The topographic features of the country seem to have a rather direct relation to the early geological or glacial history. Thus the western portion covered by the Wisconsin drift deposit shows a rather flat topography with the occurrence of saucer-like depressions, low winding ridges, and occasionally knob-like hills. To the east of this area is a chain of hills and ridges, and east of this morainic area the topography is gently to strongly rolling. The typical Iowan drift topography occurs in the northeastern part of the county. The drainage conditions in the county are not entirely adequate in some areas, and drainage is sometimes the first treatment needed to make the soils satisfactorily productive.

The soils of the county are grouped as drift, loess, terrace, and swamp and bottomland soils, the drift soils covering 73.9 per cent of the area. Including peat and muck, 26 soil types of 17 series are mapped, of which the Carrington and Clarion loams and Webster silty clay loam drift soils and the Tama silt loam loess soil cover 35.2, 19.5, 10, and 13.2 per cent of the area, respectively.

The results of laboratory, field, and greenhouse tests to determine the fertility requirements and crop adaptations of the prevailing soil types are summarized. These indicate in general that many of the soils are acid in reaction and in need of lime. Most of the soils are generally well supplied with organic matter. The nitrogen content of the soils is not low, but the phosphorus supply is rather deficient and it is considered apparent that phosphatic fertilizers will be needed on these soils in the near future.

The procedure followed in the soil survey of Iowa is outlined in an appendix.

Analyses of soils of Rabun County, L. M. CARTER, M. W. LOWRY, W. O. COLLINS, R. M. SOULE, and G. L. FULLER (*Ga. Agr. Col. Bul. 308* (*1925*), *pp. 24, pl. 1, figs. 3*).—Supplementing the physical survey made in cooperation with the U. S. D. A. Bureau of Soils (E. S. R., 51, p. 618), analyses of the prevailing soil types of the county are presented and discussed, with particular reference to the fertility requirements and crop adaptations.

Some protozoa from the soils collected by the "Quest" expedition, 1921–1922, H. SANDON and D. W. CUTLER (*Jour. Linn. Soc.* [*London*], *Zool., 36* (*1924*), *No. 239, pp. 1–12*).—Studies conducted at the Rothamsted Experimental Station are reported which showed that protozoa found in the soils from remote lands are in general identical with those found in almost any ordinary English soil. It is considered apparent, therefore, that there is a fairly well defined and characteristic soil protozoan fauna which is practically ubiquitous.

Some protozoa from the soils and mosses of Spitzbergen, H. SANDON (*Jour. Linn. Soc.* [*London*], *Zool.*, *35* (*1924*), *No. 237*, *pp. 449–475*, *pl. 1*, *figs. 6*).—Studies conducted at the Rothamsted Experimental Station are reported on the protozoa contained in 3 samples of mud, 8 samples of soil, and 14 samples of mosses from Spitzbergen. An abundant fauna was found, most of which was identical with that occurring in the soils and mosses of temperate lands. Seven new species of flagellates are described, of which, however, 5 have also been found in soils from nonarctic regions.

The effect of various factors on inoculation and nitrogen fixation in legumes, S. C. VANDECAVEYE (*Washington Col. Sta. Bul. 196* (*1925*), *pp. 13, 14*).—Studies of the killing effects of the hot, dry periods of summer and of the extreme cold periods of winter on nitrogen fixation in legumes indicated a rapidly increasing number of bacteria and a maximum of approximately 100,000,000 per gram of soil within two weeks in the greenhouse. During the following month the counts decreased to numbers varying between 10,000,000 and 30,000,000.

Counts under field conditions were quite similar to those obtained in the greenhouse so long as the moisture was approximately optimum and the maximum daily temperatures remained around 20 or 25° C. As the temperature increased and the moisture decreased, a gradual drop in bacterial numbers was observed. Further results showed that drought and heat have only a temporary effect on legume bacteria in Palouse silt loam.

Symbiosis between Chlorella sp. and Azotobacter chroococcum and nitrogen fixation, C. B. LIPMAN and L. J. H. TEAKLE (*Jour. Gen. Physiol.*, *7* (*1925*), *No. 4*, *pp. 509–511*).—Studies conducted at the University of California are briefly reported which showed that while the absolute gains of nitrogen in mixed cultures of Chlorella and Azotobacter were small, the relative gains were large. They also showed that Azotobacter is able to use the carbohydrate synthesized by Chlorella as a source of energy for nitrogen fixation. The highest figure for total nitrogen in six control cultures was appreciably lower than the lowest figure for the incubated mixed cultures. This is taken to indicate a high efficiency of the process under the conditions.

The ammonifying power of agricultural soil [trans. title], R. PEROTTI and F. AURELI (*Atti R. Accad. Naz. Lincei, 5. ser., Rend. Cl. Sci. Fis., Mat. e Nat.*, *33* (*1924*), *No. 10*, *pp. 405–408*; *abs. in Internatl. Rev. Sci. and Pract. Agr.* [*Rome*], *n. ser.*, *2* (*1924*), *No. 4*, *pp. 837, 838*).—Studies are reported which showed that perceptible differences exist between the ammonifying powers of cropped agricultural soils. Normal soils having an alkaline reaction were found generally to produce all of the ammoniacal nitrogen required by crops.

Adsorption power of cultivated soil [trans. title], P. N. PAWLOW (*Kolloid Ztschr.*, *36* (*1925*), *No. 2*, *pp. 78–81*, *fig. 1*).—Studies are reported which led to the conclusion that the removal of ions from salt solutions by soils, such as the removal of the ammonia ion from ammonium chloride solution, is the result of a complex chemical reaction and not of capillary adsorption. It is concluded further that in such a reaction the insoluble portion of the soil which exchanges its cations for ammonia is not a single substance, but consists of a mixture of a number of chemical substances.

A study of the value of crop rotation in relation to soil productivity, W. W. WEIR (*U. S. Dept. Agr. Bul. 1377* (*1926*), *pp. 68*, *figs. 10*).—The results of a study of the effects of crop rotation and of the use of fertilizers on the yields of crops are summarized, the primary objects of which were (1) to determine some definite measure of the value of crop rotation in crop production, and (2) to compare the beneficial effects of rotation with those of the

use of manure and complete chemical fertilizers in maintaining and increasing soil productivity. Data available from long-time experiments at Rothamsted; Columbia, Mo.; Wooster and Germantown, Ohio; Urbana, Ill.; and Florence, S. C., are considered.

Including all crops and all soils considered, crop rotation is said to be practically 75 per cent as efficient as the use of fertilizers in effecting increases in crop yields. In general, crop rotation is nearly 90 per cent as efficient as the use of fertilizers in effecting increases in the yields of wheat, corn, and oats. Excluding such crops as timothy, clover, and cowpeas, the average relative effectiveness of rotation is practically 20 per cent higher on soils the reactions of which have been altered or changed by liming than on acid soils.

In most cases, as determined by the conditions of the experiments considered, it has been found that rotation is 91.5 per cent as effective as the use of fertilizers in maintaining the producing power of soil. The conjoint effects of rotation and the use of fertilizers are additive as effecting increases in yields in continuous culture and rotation, or as effecting increases in soil productivity when measured by increases above the maintenance yields. On soils long under cultivation, the highest yields are possible only when rotation of crops and the use of fertilizers are conjoined.

The principles of permanent soil fertility are briefly outlined on the basis of these results.

Artificial fertilization experiment combined with different soil tillages in 1923 [trans. title], F. Glanz (*Ztschr. Pflanzenernähr. u. Düngung, 3 (1924), No. 7, Wirtschaft.-Prakt., pp. 283–300, fig. 1*).—Experiments are reported which showed that tillage by scarification, especially in combination with the use of stable manure, resulted in better crop yields than ordinary tillage which merely turns stable manure under. The power requirement of tillage by scarification is also less than of tillage by plowing and harrowing.

Residual effect of artificial fertilizer experiments with different types of tillage in 1923 [trans. title], F. Glanz (*Ztschr. Pflanzenernähr. u. Düngung, 4 (1925), No. 8, Wirtschaft.-Prakt., pp. 354–360, figs. 3*).—Data from experiments with different crops are reported which indicated the superiority of scarification to other tillage practices with reference to maintaining soil fertility under different fertilization and cropping systems.

Determination of the nutrient requirements of soils by pot experiments according to Mitscherlich and remarks on the Neubauer method [trans. title], Densch and Pfaff (*Ztschr. Pflanzenernähr. u. Düngung, 4 (1925), No. 8, Wirtschaft.-Prakt., pp. 321–339*).—The results of an application of the Mitscherlich method of determining the nutrient requirements of soil to a number of pot fertilizer experiments are reported. These corresponded quite closely to the results of actual tests of such requirements, but the method is apparently applicable only to normal soil conditions and is quite complicated.

A brief discussion of the use of the Neubauer method is included, which is considered to be less complicated.

Has soil reaction the influence in practical agriculture indicated by scientific cropping experiments? [trans. title] M. Trénel (*Ztschr. Pflanzenernähr. u. Düngung, 4 (1925), No. 8, Wirtschaft.-Prakt., pp. 340–353, figs. 2*).—A critical analysis of statistical data from cropping experiments is briefly reported which indicates that crop yields may be increased by adapting the soil reaction to the crop through quantitative liming, proper choice of fertilizers, and by proper crop rotation. It is concluded that the problem is not one merely of soil acids but of soil reaction.

Transactions of the committee on soils and fertilization of the Association of Agricultural Experiment Stations in Germany on September 18, 1924 [trans. title] (*Ztschr. Pflanzenernähr. u. Düngung, 4 (1925), No. 1, Wirtschaft.-Prakt., pp. 1–41*).—The transactions of this committee included reports on The Phosphoric Acid Requirements of German Cultivated Soils, by O. Lemmermann; New Phosphoric Acid Fertilizers and Their Action, by B. Tacke, Haselhoff, D. Meyer, and O. Lemmermann; and Methods of Determining the Fertilizer Requirements of Soil, by Gerlach, H. Neubauer, H. Niklas, and O. Lemmermann.

Effect of increasing nitrogen, potash, and phosphoric acid additions to different crops [trans. title], O. Nolte and R. Leonhards (*Ztschr. Pflanzenernähr. u. Düngung, 4 (1925), No. 7, Wirtschaft.-Prakt., pp. 286–306*).—A critical analysis of the results of a large number of fertilizer experiments with different crops is made which indicates in general that the active value of each additional kilogram of nitrogen in a rotation decreases. This was especially true for such crops as wheat, rye, barley, and sugar beets. Variations in this result obtained in different European countries are apparently due largely to soil and climatic conditions.

A new method for the use of manure [trans. title], O. Kron (*Technik Landw., 1923, No. 1, pp. 11–15, figs. 11; 1924, No. 2, pp. 29–31, figs. 3*).—The so-called Krantz method of storing and using stable manure is outlined, and equipment for its practice is described. This method involves the storage of the manure in layers under sufficient pressure to retard fermentation and prevent losses of nutrient materials by leaching and volatilization.

Agriculture and sewage utilization [trans. title], Christmann (*Technik Landw., 1924, No. 2, pp. 21–24*).—An account is given of the methods practiced by several cities in southern Germany of disposing of their sewage by irrigation of agricultural lands, and by the use of the sludge as a direct fertilizer.

Municipal waste as fertilizer material [trans. title], J. Bodler (*Technik Landw., 1924, No. 2, pp. 27, 28*).—Studies are summarized which indicate that the household wastes of German cities, including garbage, ashes, trash, and sewage, can be separated into fine and coarse material. The coarse material can best be burned, but the fine material has been found to possess a higher fertilizing than heating value. A mixture of fine wastes with sewage sludge has proved to be an especially valuable fertilizing material.

Soil productive waste processes of cities [trans. title], L. Migge (*Technik Landw., 1924, No. 2, pp. 24–26*).—Data are presented on methods of utilizing municipal wastes as fertilizer materials. These show that the dilution of fecal matter until complete solution has taken place reduces its fertilizing value as much as twentyfold. Mixing with soil, on the other hand, tends to increase its fertilizing value.

Action and profit of nitrogen fertilization on different agricultural crops [trans. title], Weiss (*Ztschr. Pflanzenernähr. u. Düngung, 3 (1924), No. 4, Wirtschaft.-Prakt., pp. 129–166*).—A large amount of data is summarized which showed that the greatest returns were obtained from the use of nitrogenous fertilizers on winter wheat, potatoes, and beets under the prices and conditions prevailing in Germany during 1923 and 1924. The second best returns were obtained from such fertilization on summer grains, while the lowest returns were obtained with meadow hays and grasses.

The action of nitrogenous fertilization on leguminous crops depended largely on the activity of the nodule bacteria. This result was taken to indicate that the use of nitrogenous fertilizers on legumes is justified merely to supplement and not to supplant the activity of the nodule bacteria.

Influence of urea, thiourea, and allylthiourea on higher plants [trans. title], E. and G. Nicolas (*Compt. Rend. Acad. Sci.* [*Paris*], *180* (*1925*), *No. 17*, *pp. 1286–1289*).—Studies are reported which showed that urea in amounts greater than 0.1 per cent is toxic to the higher plants. This toxicity varied with the different crops and seemed to be a function of the activity of the urease secreted by each plant and the sensitiveness of this to ammonia. Thiourea and allylthiourea were toxic in even smaller concentrations, and this effect was apparently not due to products of decomposition under the action of diastases.

Comparative investigations on determining the requirements of soils for phosphoric acid [trans. title], M. J. van der Spuij (*Ztschr. Pflanzenernähr. u. Düngung, 5* (*1925*), *No. 5, Wiss., pp. 281–325*).—Studies are reported which showed that the soil phosphoric acid soluble in 1 per cent citric acid gives an indication of the requirement of the soil for phosphoric acid fertilization. An even better indication is given by a comparison of the relative solubilities of the total phosphoric acid content and of the phosphoric acid soluble in 1 per cent citric acid. A N/5 solution of nitric acid gave similar results. However, the relative solubility of the phosphoric acid yielded more satisfactory results, since it always stood in inverse ratio to crop yields.

A 0.5 per cent solution of citric acid was found to be the best solvent for phosphoric acid. The use of this solvent not only indicated the phosphoric acid requirement but expressed the relative solubility of the total phosphoric acid on the one hand, as compared with the relative solubility of that soluble in 10 per cent hydrochloric acid on the other. It was found, without exception, that a soil reacted better to phosphoric acid the lower the value of the relative solubility.

Some experiments on the solubility of Saldanha and Grahamstown phosphates in the soil, A. Stead (*Union So. Africa Dept. Agr., Sci. Bul. 36* (*1925*), *pp. 15*).—Studies on the solubility of these two natural phosphates are reported. Saldanha phosphate was found to be a valuable phosphatic fertilizer on irrigated Karroo soils, but it was inactive on acid humus soil types. The application of sodium carbonate to the latter soil type produced a marked solution of the soil phosphate, and had some influence on the Saldanha phosphate. Sodium bicarbonate had no marked influence on the solubility of Saldanha phosphate in Karroo soil.

The conclusion is drawn that, while the soil phosphate and the Grahamstown phosphate are similar in character, the Saldanha phosphate is dissimilar to both, and that the Grahamstown and the Grahamstown soil phosphates are not iron aluminum phosphates.

Four-year fertilization experiment with increasing potash additions [trans. title], Kuhnert (*Ztschr. Pflanzenernähr. u. Düngung, 4* (*1925*), *No. 7, Wirtschaft.-Prakt., pp. 307–310*).—The results of this experiment are briefly summarized showing that increases in grain and root crops were uniformly obtained with increases in the potash applications up to 1,200 kg. per hectare (1,068 lbs. per acre) of 40 per cent potash salt on poor sand heather sheep pasture soils. The residual effect of this salt on rye following potatoes was greater in the fourth year than in the first.

Transformation of caustic lime into calcium carbonate in soil and the cause of lime fixation [trans. title], E. Blanck and F. Scheffer (*Ztschr. Pflanzenernähr. u. Düngung, 4* (*1925*), *No. 2, Wirtschaft.-Prakt., pp. 66–69*).—In a further contribution on the subject from the University of Göttingen (E. S. R., 53, p. 516), data are briefly reported which indicate that the cause of the adsorptive fixation of lime and the consequent interference with the

quantitative transformation of calcium oxide to calcium carbonate in soils lies in the presence of colloidal clay and active silicic acid.

Do Delaware soils need lime? C. R. RUNK (*Del. Univ., Agr. Ext. Bul. 11 (1925), pp. 14, figs. 4*).—Practical information on the use of lime on Delaware soils is presented, which is based on the results of field experiments.

Field experiments with gypsum in Iowa, L. W. ERDMAN and W. B. BOLLEN (*Iowa Sta. Bul. 232 (1925), pp. 99–119*).—The results of a number of field experiments begun in 1920 to test the effect of gypsum on different crops when grown on various soil types in Iowa are summarized.

On account of the short duration of these experiments, the value of the results is considered to be indicative only of what may be expected if similar tests are carried out under similar conditions on a larger scale and for a longer period of time. However, the results as a whole indicated that on some of the fields very noticeable increases in the yields of oats were secured from the use of gypsum, while on other fields no beneficial effects were obtained. The same results were obtained regarding the effect of gypsum on the production of red clover, but very positive benefits were obtained from the use of gypsum on all of the alfalfa fields.

The soils which responded to gypsum fertilization in these tests are the Carrington loam, silt loam, and fine sand, the Grundy silt loam, and the O'Neill sandy loam.

Carbon dioxide as a stimulant and fertilizer [trans. title], W. SCHMIDT (*Ztschr. Pflanzenernähr. u. Düngung, 4 (1925), No. 4, Wirtschaft.-Prakt., pp. 162–171, figs. 2*).—A summary of the results of work bearing on the subject by the author and others is presented, with particular reference to the influence of carbon dioxide on forest growths.

Inspection of commercial fertilizers for 1925, T. G. PHILLIPS, T. O. SMITH, and A. W. PETRE (*New Hampshire Sta. Bul. 219 (1925), pp. 15*).—Guaranties and actual analyses of 113 samples of fertilizers and fertilizer materials collected for inspection in New Hampshire during 1925 are presented and briefly discussed.

AGRICULTURAL BOTANY

Selective absorption of ions by seeds, W. RUDOLFS (*Soil Sci., 20 (1925), No. 3, pp. 249–252, fig. 1*).—Results of investigations as previously published (E. S. R., 50, p. 523; 53, p. 828) show that seeds in salt solutions and in mineral and organic acids change the H-ion concentration of these liquids, moreover that different seeds can change the H-ion concentration of the solutions to definite points, a certain equilibrium being reached in all salt solutions or acids after the seeds have been immersed sufficiently long. The results thus far show that seeds placed in an acid solution will decrease the free hydrogen ions to a definite pH value, and that seeds in alkaline solutions will bring the pH value of the solutions down to the same definite point for each kind of seed. Each seed changes all dilute acids and salt solutions to the same characteristic point, and an equilibrium is reached with decreasing rapidity after a definite time. The chemical properties of the chief protein content of the seeds seemed responsible for the changes in H-ion concentration.

In the work recorded by the present paper, corn and soy bean seeds were immersed in representative salt solutions, the changes in H-ion concentration and the rate of reaction change being recorded after definite time intervals. A rapid lowering of pH values in the salt solutions occurred, and this was followed by a slower rate of change to higher pH values until a definite equilibrium was reached. It appears that the differential absorption of ions

is influenced greatly by the amphoteric character, amount, and kind of proteins present in the seeds. The rate of ion absorption is influenced by the concentration of the salt solution. In connection with the experiments recorded, the high precipitation power for proteins of aluminum salts is briefly discussed.

Selective-permeability characters in seed coats, J. P. VAN DER MAREL (*Bijdrage tot de Kennis van Selectief-Permeabele Eigenschappen van de Zaadhuid. Edam, Netherlands: Keizer & Van Straten,* [*1919*], *pp.* [*4*]*+101, pl. 1, figs. 2*).—This is a University of Amsterdam thesis.

Measurements of carbon dioxide evolved from the roots of various crop plants, J. D. NEWTON (*Sci. Agr., 4* (*1924*), *No. 9, pp. 268–274, fig. 1*).—The author has extended the method employed in the work previously reported (E. S. R., 50, p. 524) to include simultaneous measurements of rates of transpiration in various crop plants.

A simple method is described of measuring simultaneously the rates of CO_2 evolution from the roots of growing plants and transpiration. It is stated that a reasonably close correlation exists between transpiration rate and CO_2 evolution from the roots, though the data do not prove important differences in the total CO_2 per unit of dry matter given off by roots of different crop plants during growth.

It is estimated that a good deal more CO_2 is normally produced in the soil each year by the decomposition of organic matter than is produced during the growing season by the respiration of the roots of a growing crop. It is suggested, however, that the CO_2 from the roots may play a much greater part in the economy of the plants than its proportion to the total amount of CO_2 produced in the soil would indicate.

The possible importance of the CO_2 produced in the soil as a solvent of plant nutrients and as an immediate source of CO_2 for photosynthesis is discussed briefly, and various suggestions for further experimentation are made.

The effect of semi-defoliation in root crops, H. H. STIRRUP (*Agr. Prog.* [*Agr. Ed. Assoc., London*], *2* (*1925*), *p. 109*).—The experiments were undertaken in order to estimate the loss in the crop due to a partial defoliation at some period during the growing season comparable with an attack on the leaves by an insect or fungus. Weighings of swedes and mangolds were taken from plants in average rows in the field, and it was found that from 40 to 50 were necessary to obtain reasonably accurate results.

"Alternate plants in average rows of mangolds and sugar beet were semidefoliated on August 12, 1924. The crop was lifted and weighed on October 22. Assuming that the crop from the untouched plants represented 100 per cent, the crop from the semidefoliated mangolds was 89 per cent and that from the semidefoliated sugar beet was 81 per cent."

Senescence and rejuvenescence in the cells of the potato plant, B. F. LUTMAN (*Vermont Sta. Bul. 252* (*1925*), *pp. 3–76, pls. 12, figs. 5*).—The author has given the results of a study on the nuclear division and young cells of the root tip; young and old cells in flowers, tubers, stems, and leaves; and the regeneration of the cells of the potato tuber after aging and differentiation.

Summarizing the results of his investigations with regard to youth and old age in plants as shown in the visible structural changes in the cells of the potato plant, the author found that young cells are filled with an abundance of protein material, especially the nuclei where it is collected in stainable aggregates of considerable size, and in the very large nucleoles. Old cells have less visible protein material in the nucleus in the form of granules, and the bulk of the cytoplasm is filled with large vacuoles. The chromatin seems

to be used up in the process of differentiation, the most highly differentiated cells containing the least amount. The nucleoles become small in size and stain less intensely. The death of a cell is preceded by a general collapse of all parts of the cell with marked hydrolysis of the colloids.

The rejuvenescence of the starch cells of the tubers is said to take place as follows: The rejuvenating cells free themselves mechanically from the accumulated starch, they accumulate reserve protein aggregates in the form of granules in the nucleus before they are again capable of division, and they accumulate fat or fatlike substances in the cytoplasm with which to impregnate the newly formed cell walls.

Some high-temperature effects in apples: Contrasts in the two sides of an apple, C. Brooks and D. F. Fisher (*Jour. Agr. Research* [*U. S.*], *32* (*1926*), *No. 1, pp. 1–16, pls. 4, figs. 2*).—The injuries to the apple fruit resulting from certain periods of high temperature in 1918 and 1924 are described, and attention is called to the fact that the effect of a particular temperature varied with the conditions under which the fruit was growing. Losses from heat are said to have occurred when extremely high temperatures were preceded by periods of relatively cool weather, and a shortage of soil moisture was apparently a factor in the development of heat injury in many cases examined. Starved or stunted apples were found to show a greater resistance to heat injury than those that were making a normal or rapid growth. The location and the pattern of heat injuries are said to be determined to some extent by previous exposure, the fruit surfaces that had been exposed to strong sunlight being more resistant than those that had been partially protected. The exposed sides of exposed apples were found to have temperatures from 10 to 16° F. higher than the shaded sides of the same apples, and from 12 to 25° higher than the air in the shade. The exposed sides of exposed apples had a uniformly higher sap concentration than the shaded sides.

On the rôle of calcium hydroxide in hydrated lime-acid lead arsenate sprays, F. L. Campbell (*Jour. Agr. Research* [*U. S.*], *32* (*1926*), *No. 1, pp. 77–82*).—A study was made of the conditions under which there is injury to foliage following spraying with lead arsenate to which hydrated lime had been added.

The probable reactions of calcium hydroxide-acid lead arsenate sprays are indicated, and the usual protective effect on foliage of calcium hydroxide in acid lead arsenate combination sprays is thought to lie in the fact that soluble calcium arsenate from such sprays is less toxic to foliage than soluble arsenic acid from sprays of acid lead arsenate alone. Apparently under warm and humid conditions acid calcium arsenate may become present on foliage sprayed with $Ca(OH)_2+PbHAsO_4$, in high enough concentration and over a sufficient period of time to cause severe foliage injury.

Agricultural ecology, W. S. Gray (*Agr. Prog.* [*Agr. Ed. Assoc., London*], *2* (*1925*), *pp. 24–28*).—A statement of the general problem of agricultural ecology and illustration of phases, factors, and bearings are presented, with an account of the influence of the time of application and the quantity of water, this experiment showing the existence of a critical period occurring between the sixth day before heading and the sixth day after the appearance of the ear. "The straw length and all the correlative characters are increased with the increase in the amount of water available to the plant during the critical period." Data from work with other plants are briefly given.

"To follow up the new system of research, information respecting crops must be collected relative to critical periods, percentages of probability of various meteorological phenomena for each 10-day period during the season of growth, and decrease of yield caused by unfavorable conditions.

"Briefly, the aim of agricultural ecology is the determination of the climatic zones of wheat and other plants throughout the world, and the coordination and direction of research, the ultimate object being the possibility of stating definitely what crop, and what particular variety of the crop, is most suitable for any given climatic and environmental conditions."

Experimental vegetation: The relation of climaxes to climates, F. E. Clements and J. E. Weaver (*Carnegie Inst. Wash. Pub. 355 (1924), pp. VII+172, pls. 15, figs. 41.*)—This publication presents results of the attempt to utilize in ecology, as has been done elsewhere, training, experience, basic procedure, and adequate perspective. This report outlines, in the introductory portion, the scope and plan of the work, principles, methods, values, objectives, and factors. An account follows of experimentation and results during 1920–1923, with a résumé in appropriate detail of the different features.

"The conclusion seems to be warranted that the general objective of developing the basic method of experimental vegetation so that it combines the maximum of demonstrability and objectivity has been achieved. While the methods involved require further refinement and testing, there can be little question that they are prerequisite to fundamental and permanent progress in the field of vegetation. The special objectives set have also been attained, though necessarily in varying degree, since such problems as those of the cycle and of competition will constantly unfold with advancing research. Both planting and factor results have confirmed the essential variety within unity that characterizes the grassland formation with its associations, and harmonize completely with the evidence from cyclic changes and relicts. They have further illuminated the relation of seral habitats and communities to those of the climax, and have likewise justified the concepts of subclimax, postclimax, and preclimax. The essentially subclimax nature of the low prairie has been corroborated, as have also the climatic and phylogenetic relationships of the subclimax prairie. The evaluation of competition as a controlling process in grassland has been attended by unexpected success, especially in connection with the persistence of subclimax prairie in regions of forest climate. With respect to natural migration, the experimental evidence lends no support to the assumption that single or scattered individuals regularly invade climaxes with success, but on the contrary indicates that all such invasion is a mass movement in response to wet and dry phases of climatic cycles. The demonstration of the phyletic relationship between subclimax prairie, true prairie, mixed prairie, and short-grass areas and between the corresponding climates in the first three cases appears conclusive, and in conjunction with relict and cyclic results will constitute the basis for future research in the grassland formation."

On the zonation of the vegetation in the Port Wakefield district, with special reference to the salinity of the soil, T. G. B. Osborn and J. G. Wood (*Roy. Soc. So. Aust. Trans. and Proc., 47 (1923), pp. 244–254, pl. 1, fig. 1*).—The present paper embodies results of a visit during 1923 to the Port Wakefield district, having as its object the study of the zonation of the vegetation when passing from a halophyte community to a saltbush community. The zonation observed is correlated with certain edaphic features of the environment, which are outlined.

On some halophytic and non-halophytic plant communities in arid South Australia, T. G. B. Osborn and J. G. Wood (*Roy. Soc. So. Aust. Trans. and Proc., 47 (1923), pp. 388–399, pls. 2, figs. 2*).—In this paper, which follows up that above noted, an account is given of the chenopodiaceous plant communities occurring in the plains and peneplains of the arid Northeast of South Australia, with related facts and features regarding the regions covered.

On transpiration in the field of some plants from the arid portions of South Australia, with notes on their physiological anatomy, J. G. Wood (*Roy. Soc. So. Aust. Trans. and Proc., 47 (1923), pp. 259–278, pl. 1, figs. 20*).—"*The transpiration rates of Casuarina lepidophloia, Geijera parviflora, Pholidia scoparia, Rhagodia gaudichaudiana, Atriplex vesicarium,* and *Kochia sedifolia* are measured and discussed in relation to the external factors influencing transpiration. The methods of measuring transpiration, evaporating power of the air, relative humidity, and light intensity are described. The anatomy of the shoots is discussed from a physiological standpoint. A water-storage tissue in the Casuarineae and a type of hair in the Chenopodiaceae hitherto undescribed are recorded. An attempt is made to correlate the transpiration rates with the anatomical modifications of the leaves."

Plant forms and their evolution in South Africa, J. W. Bews (*London and New York: Longmans, Green & Co., 1925, pp. [9]+199, pl. 1, figs. 31*).—This work as a whole is said to represent the net results of study during 14 years of South African vegetation. "At present the information gained in no way contradicts the more generally accepted principles of phylogenetic classification as applied to the flowering plants. At the same time many hitherto unnoticed details are brought to light." The work is supplied with a bibliography and an index.

Seeds and plants imported by the Office of Foreign Seed and Plant Introduction, Bureau of Plant Industry, during the period from [April 1 to September 30, 1923] (*U. S. Dept. Agr., Inventories Nos. 75 (1926), pp. 53, pls. 2; 76, pp. 22*).—Lists, with descriptive notes, are given of more than 1,200 lots of seeds and plants introduced from April 1 to June 30 and July 1 to September 30, 1923.

GENETICS

A comparative study of the chromosomes of mammals, T. S. Painter (*Amer. Nat., 59 (1925), No. 664, pp. 385–409, figs. 9*).—This is a complete account of the investigation previously noted (E. S. R., 53, p. 523).

The reduction division in relation to mutation in plants and animals, E. C. Jeffrey and G. C. Hicks (*Amer. Nat., 59 (1925), No. 664, pp. 410–426, figs. 8*).—The occurrence of irregularities in the meiotic division of plants of hybrid origin is discussed, and it is pointed out that similar irregularities occur in the reduction division in *Drosophila melanogaster* as contrasted with a very regular meiotic division in grasshoppers. The hypothesis of the hybrid origin for this species also tends to account for the frequency of mutations.

An alfalfa bud mutation, L. R. Waldron (*Jour. Heredity, 16 (1925), No. 11, pp. 423, 424*).—A branch which bore pure white flowers and originated from the crown was found at Fargo, N. Dak., on an alfalfa plant with lavender flowers. The plant in which the bud mutation occurred grew from seed of a flower-seed albino (the absence of color is confined to the flowers and seeds) subject to open pollination with plants of the same descent. The author attempts to explain the factorial relations responsible for mutation.

A new leg mutant in Drosophila melanogaster, J. D. Guthrie (*Amer. Nat., 59 (1925), No. 664, pp. 479, 480*).—In experiments at the Ohio State University, flies have been produced with shortened and thickened tarsal joints. This condition was found to be due to a factor located near purple in the second chromosome, which was recessive to the normal.

The occurrence of an eye and of a tooth abnormality in a line of albino rats, E. E. Jones (*Amer. Nat., 59 (1925), No. 664, pp. 427–440*).—A complete account of the investigations previously noted from an abstract (E. S. R., 54, p. 226).

Polymorphy in Vaccinium uliginosum *[trans. title]*, H. E. PETERSEN *(Bot. Tidsskr., 38 (1924), No. 3, pp. 217–240, figs. 2)*.—Studies on polymorphy in *V. uliginosum*, from the point of view of possible connection between polymorphy and evolution, are outlined as showing polymorphy to be in some measure a consequence of evolution.

Of 162 combinations theoretically possible in leaf form characters, 104 were found, but only a small number of these were present in any large proportion.

Inheritance studies in cereals, E. F. GAINES *(Washington Col. Sta. Bul. 196 (1925), pp. 26, 27)*.—Further observations (E. S. R., 52, p. 825) were made on the comparative resistance of F_3 wheat families and parents to bunt. In crosses combining Martin or Hussar with a susceptible variety, the susceptibility of the weak parent was recovered in less than 10 per cent of the rows. Their resistance appears partially dominant but caused by multiple factors. Part of the genes causing resistance to bunt in Ridit are evidently borne in a different set of chromosomes from those causing immunity in Martin. Among the spring wheats Florence×Marquis produced the largest percentage of immune F_3 rows, both parents being resistant. Of 44 varieties of oats tested for resistance to covered smut, 9 proved immune.

In genus crosses, normal fertility was recovered in certain F_3 plants in both wheat×*Aegilops cylindrica* and wheat×rye, the chromosome number in the fertile plants being that of the female parent in each case. The reduction divisions were normal, but part of the male chromosomes appeared to be present. The divisions in the F_1 and F_2 generations were mostly very irregular, the gametic number varying from 0 to 35 and from 0 to 28, respectively. One plant supposed to be an F_1 of Hybrid 128×Aegilops had all the somatic characters of Hybrid 128 but was practically sterile. Cytological examination indicated that its somatic cells had the haploid number of chromosomes. Evidently the Aegilops pollen stimulated development of the seed without fusing with the embyro nucleus.

Genetics of Marquis×Turkey wheat in respect to bunt resistance, winter habit, and awnlessness, E. F. GAINES and H. P. SINGLETON *(Jour. Agr. Research [U. S.], 32 (1926), No. 2, pp. 165–181, figs. 3)*.—According to this contribution from the Washington Experiment Station, Marquis spring wheat when spring seeded is highly resistant to bunt but is comparatively susceptible when fall sown. When fall sown, Turkey winter wheat is highly resistant and when spring sown is immune.

Transgressive inheritance took place in both fall and spring seedings of the F_3 of Marquis×Turkey, suggesting that the parental resistance is due to different factors. The significant correlation between the amount of bunt produced by the fall-sown and the spring-sown F_3 families indicated that the factors causing resistance in the fall seedings are also operative in the spring plantings. Resistance in Marquis×Turkey seems due to two factors, the one carried by Turkey being much more "prepotent" than that of Marquis. Partial dominance of spring habit and the inheritance of winter habit appeared to be controlled by multiple factors. F_2 and F_3 later-ripening spring plants were more resistant than the early ones.

Awns appeared to be inherited as a unit character. Although awned F_3 families were somewhat more resistant than the awnless ones, there seemed to be little, if any, linkage between awns and resistance. The average date ripe of the awnless, intermediate, and awned F_3 families was about the same. The ratios of awnless to awned families in the group producing one or more winter plants and in the true spring group were similar.

A genetical study of the fertility of the lateral florets of the barley spike, M. C. GILLIS *(Jour. Agr. Research [U. S.], 32 (1926), No. 4, pp. 367–*

390, figs. 4).—Hybrids involving varieties of *Hordeum vulgare*, *H. intermedium*, *H. distichon*, and *H. deficiens* were carried through the F_2 and in some cases through the F_3 generation in studies at Cornell University.

In certain hybrids lack of fertility of the side florets appeared to be a partly dominant character. In both crosses where the 6-rowed form was used as one of the parents, one-fourth of the F_2 progeny were 6-rowed. There seemed to be an essential factor, *Z*, which differentiates the 6- and 2-rowed condition of fertility. In a cross of 6-rowed by *H. deficiens* no other factor was concerned; if a second factor was present, it was the same in both parents. A second factor, *W*, when present with the *Z* factor, is responsible for various degrees of fertility of the side florets. Its presence or absence may not affect the phenotypic appearance of the 6-rowed forms, so that the 6-rowed forms appear to be homozygous, although the factor *W* may or may not be present. The deficiens character seems due to a third factor, *D*, for fertility of the side florets and the deficiens form carries the recessive *d*. The *D* factor is also assumed to be recessive in the 6-rowed forms; its expression as absence of the side florets apparently can not occur without the *Z* factor.

Inheritance of pale green seedlings in maize, M. Demerec (*Genetics, 10* (*1925*), *No. 4, pp. 318–344*).—Five pale green types of corn seedlings were analyzed genetically, principally at Cornell University, all possible intercrosses being made.

The xanthophyll and carotin contents in all the types investigated were found to be practically normal, the differences between the various types being in their chlorophyll contents. Pale green 2 (Pg_2pg_2), which has about 50 per cent of normal chlorophyll, was found to be linked with dwarf (*Dd*), crossing over about 32 per cent, and to be inherited independently of *Sh sh*, *Cc*, *Rr*, *Su su*, and *Yy*. Pale green 3 (Pg_3pg_3), which has about 30 per cent of the normal chlorophyll content, is linked with brown aleurone color (*Bn bn*) with 4.5 per cent of crossing over. Pale green 4 (Pg_4pg_4), which has about 50 per cent of the normal chlorophyll content, appeared to be inherited independently of *Wx wx*, *Cc*, *Rr*, *Aa*, *Lg lg*, *Yy*, and *Su su*. Pale green 5 (Pg_5pg_5) has about 80 per cent of the normal chlorophyll content. Xantha 2 (Xn_2xn_2) has about 10 per cent of normal chlorophyll and resembles the xantha already described in corn (E. S. R., 52, p. 727).

Size of cob in maize as affected by the number of fertilized ovules, J. H. Kempton (*Amer. Nat., 59* (*1925*), *No. 665, pp. 566–570, figs. 2*).—Measurements on certain hand-pollinated corn progenies showed that in addition to an increased number of seeds, ears resulting from two applications of pollen were longer and had more rows than those resulting from a single pollination.

Heredity in the cultivated beet, J. L. de Vilmorin (*L'Hérédité chez la Betterave Cultivée. Paris: Gauthier-Villars & Co.,* [*1923*], *pp.* [7]+*153, pls* [*40*], *figs.* [*73*]).—Chapter 1 of this comprehensive dissertation discusses wild beets, their characteristics, and their relations to cultivated types; chapter 2 describes hybrids between the wild forms and cultivated varieties; chapter 3 traces the origin of the cultivated varieties and comments on their relative stability; and chapter 4 deals with theories relative to heredity in the beet and discusses problems of the life cycle, color, anomalies observed in the author's cultures, modern selection methods, inheritance of sugar content, and various phases of genetics. The appended bibliography includes 219 titles.

Inheritance studies with some tobacco varieties [trans. title], M. Khristov (Christow) (*God. Sofiisk. Univ., Agron. Fakult.* (*Ann. Univ. Sofia, Facult. Agron.*), *3* (*1924–25*), *pp. 1–35; abs. in Ztschr. Pflanzenzücht., 11* (*1925*), *No. 1, p. 43*).—Crosses were made between native red, rose, light rose, and

white flowering tobacco varieties in the inheritance studies reported. The light rose had large corollas corresponding to those of *Nicotiana tabacum macrophylla*. The F_1 of the crosses white×red, rose×white, red×rose, and white× light rose were intermediate in color, form, and size of corolla. The F_2 segregation suggested that the corolla color is due to three factors, *W* causing red, *S* light rose, and *R* a factor, which tones down *W*; *S* tones down *W* when *R* is present, and neutralizes when *R* is absent. The factorial combination responsible for the red blooming form is *Wrs*, the rose *WRS*, and the light rose *WRs*. Three factors seemed to be concerned with corolla form, *M* producing macrophylla, *T* tabacum, and *L* intermediate; *T* neutralizes *M*, and with *tlm* the tabacum form appears. Size of corolla was also due to three factors, *A* producing large corollas, *a* small, *B* and *C* separately further depressing the size, and with *A* giving intermediate.

The inheritance of color and markings in rodents [trans. title], C. Kosswig (*Ztschr. Tierzüchtung u. Züchtungsbiol., 5 (1925), No. 1, pp. 101–129*).—A review of the factors which have been found to influence color, markings, and hair length in the rabbit, guinea pig, rat, and mouse, based on the results of investigations conducted in the United States and in the European countries. The linkage relationships so far established in the different animals are also noted.

Correlated characters in a maize hybrid, J. H. Kempton (*Jour. Agr. Research [U. S.], 32 (1926), No. 1, pp. 39–50, figs. 3*).—The inheritance of quantitative characters in a hybrid between a many-rowed Algerian pop corn of short stature and Jala (E. S. R., 52, p. 733), a giant dent variety, was studied in the Bureau of Plant Industry, U. S. D. A.

Although size differences were great, no evidence was apparent in the F_2 of bimodality in the frequency curves of any of the 13 characters studied. Only one genetic correlation among these characters involved a direct relation with yield, i. e., plants of long season tended also to produce long ears. This relationship was negative in the F_1, indicating that with genetic factors eliminated environmental factors favoring rapid growth also favored the production of long ears. Number of rows on the ear was found to be slightly correlated with two other characters, neither of which was associated with yield. No genetic correlations seem to exist in this hybrid between number of rows on the ear and either yield as measured by the ear lengths or rapidity of growth as measured by the period required for flowering. The paucity of physiological correlations with number of rows indicated that environment has little effect upon this character. While the parents differed in the color of the aleurone layer of the seeds, aleurone color did not seem to be associated with the size character of the parents.

A hybridological analysis of Triticum persicum Vav. [trans. title], N. I. Vavilov and O. V. Îakushkina (*Trudy Prikl. Bot. i Selek.* (*Bul. Appl. Bot. and Plant-Breeding*), *15 (1925), No. 1, pp. 3–159, pls. 2, fig. 1*).—Many and diverse varieties of Persian wheat, *T. persicum* (E. S. R., 53, p. 35), have been found under cultivation in the mountainous districts of Georgia and Armenia. Characteristic of this wheat are its immunity to mildew, its chromosome number (haploid=14), and its milling and baking qualities. To establish its phylogenetic position the authors crossed Persian wheat with 13 botanical species (49 varieties) of wheat and Secale and Aegilops.

Persian wheat crosses readily only with species characterized by 14 chromosomes (*T. durum*, *T. dicoccum*, *T. turgidum*, *T. polonicum*). In crosses with the vulgare group marked sterility of the hybrids was evident, and this was yet higher in crosses with *T. monococcum*. Most of the kernels obtained from

crosses with the *T. vulgare* and *T. monococcum* groups were poor in quality and did not germinate. Sterility of the hybrids (F_1) also resulted from crosses with *A. triuncialis* and *S. cereale*.

Genetic analyses of the principal characteristics of Persian wheat were made. Among the various hybrids studied were observed phenomena of increase and decrease in the intensity of the quantitative characters, the length of the awns, the elongation of the ear and of the glumes, the immunity to infectious diseases, and the length of the vegetative period.

Exhibiting the external characters of soft wheats and at the same time being genotypically close to durum wheats, *T. persicum* by its geographical distribution appears to be a connecting link between the Asiatic group of wheats headed by *T. vulgare* and the African-Mediterranean species *T. durum*, *T. dicoccum*, and *T. turgidum*.

Special types of segregation of *T. persicum* × *T. monococcum* are described, with comment on the classification of the types of segregation of interspecific hybrids. An English abridgment is appended (pages 110–159).

Materials for a monographic study of a new species of cultivated wheat, Triticum persicum Vav. [trans. title], A. I. ATABEKOVA (*Trudy Prikl. Bot. i Selek. (Bul. Appl. Bot. and Plant-Breeding), 15 (1925), No. 1, pp. 161–198, figs. 2*).—Investigation of the separate races of Persian wheat showed that in this, as well as in durum and soft wheat, is to be seen a parallelism and regularity in the variation of characters.

Linkage between sweet-defective and sugary endosperm in maize, J. B. WENTZ (*Genetics, 10 (1925), No. 4, pp. 395–401*).—Crosses were made between the sweet-defective endosperm strain in Golden Bantam sweet corn, described earlier by Lindstrom (E. S. R., 49, p. 826), and five different starchy strains. Study of the self-pollinated progeny of these crosses revealed linkage between the defective endosperm type and sugary endosperm, with a crossover of 3.2 per cent.

Linked factors in soy-bean, I. NAGAI and S. SAITO (*Japan. Jour. Bot., 1 (1923), No. 3, pp. 121–136*).—A completely glabrous individual appeared at the Experiment Station in Ômagari among the progenies of the hybrid between two pubescent types of soy bean (*Glycine soja*), possibly due to a factor mutation. Glabrous appeared to be simple dominant over pubescent. Linkage existed between the factor for glabrousness and that for the mottling pattern in the seed coat. About 18 per cent of crossing-over was observed. The mottling pattern is greatly reduced where the ground color is cinnamon instead of brown. Assimilation and growth seemed to be weaker in the glabrous than in the pubescent plant.

Studies on sex differentiation in fowls, G. F. FINLAY (*Brit. Jour. Expt. Biol., 2 (1925), No. 4, pp. 439–468, pls. 6*).—The effect of castration and gonad transplantation on the development of sex characters in chicks has been investigated at the School of Agriculture, Cambridge, and in the Animal Breeding Research Department, Edinburgh.

In preliminary experiments it was found that castration of the male guinea fowl had no effect on the type of feather development. In another test a male fowl was castrated at 6 weeks to 2 months of age, and chopped ovary was placed in the abdominal cavity. The feathering and comb development on this bird became henny except for the sickles. It also showed other characteristics of both sexes in regard to behavior. Four testes were inserted in the abdominal cavity of a female chick at 4 days of age. A typical pullet body and plumage resulted, with a masculine comb. The bird died at 8 months of age, due to the stoppage of the oviduct by an unusually large egg. A post-mortem exami-

nation showed the presence of a nodule of a testicle attached to the abdominal wall, which contained normal tissue and actively motile sperms.

The main part of the experimental work was carried on with 30 young chicks operated at from 2 to 11 days of age. Eight groups of birds were formed in this way, consisting of the two normal sexes, castrated birds of both sexes, and castrated and normal birds with gonad grafts of the opposite sex.

From studies of the characteristics during development, sex differences in size, body shape, spurs, and mentality appeared to be little if at all altered by grafting gonads of the opposite sex. Plumage, comb, and temperament characters were modified by the replacement of the normal gonads by the gonads of the other sex. The females with ovaries and testicles showed the effect of the latter only in the masculine development of the head furnishings and in the tipping of the plumage. Very interesting findings were the development of nodules of testicular tissue from ovarian grafts made earlier than 4 days of age in castrated males and from very small portions of ovary accidentally left after ovariotomy.

This and other evidence are discussed, pointing toward a specific stimulus of the embryonic soma for gonad differentiation which was lost soon after hatching. It was shown that gonads of both sexes could develop and function normally in the same individual. The amount of gonad tissue present was directly related to the degree of development of certain of the organs affected.

Gonad grafts in the fowl, A. W. Greenwood (*Brit. Jour. Expt. Biol., 2 (1925), No. 4, pp. 469–492, pls. 4*).—This is a report of a histological study of the gonad grafts in 19 of the chicks selected from the various groups described in the above paper. This work proved that some ovarian grafts show extensive changes resulting from a secondary proliferation of the sex cords, with further differentiation into tubules of a definitely spermatic type, while others remained typically ovarian in structure. The testis grafts were either in active spermatogenesis or consisted of a mixture of active and atrophic tubules. The proliferation of the sex cords with one exception occurred in grafts made earlier than four days after hatching. Typical "luteal" cells were present in the interstitial tissue between inactive tubules in testis grafts, but were not associated with a henny type of plumage.

Quantitative studies of the testis.—I, Some observations on the cryptorchid testes of sheep and swine, K. F. Bascom (*Anat. Rec., 30 (1925), No. 3, pp. 225–241, figs. 22*).—The author reports the results of a quantitative study of the relation between the amounts of tubular and interstitial tissue in the testicles of normal and cryptorchid swine of approximately six to nine months of age, together with the weights of the testicles of normal and cryptorchid sheep. In making these studies the testicles were dissected out and weighed, and a block of tissue was prepared for sectioning. After making a microscopic study of the sections, drawings were made of a representative area by the use of an Edinger projection apparatus. The tracings of the tubular and interstitial areas were cut out and weighed separately. The percentages of each type of tissue were calculated, and the actual weights of the two kinds of tissue were estimated.

The study showed that considerable differences existed in the pattern of the testicles of individual sheep and swine, whether normal or cryptorchid. No evidence of hypertrophy occurred in the remaining testicles or in the interstitial tissue after semicastration.

On the nature of foetal re-absorption, C. N. H. Long and A. S. Parkes (*Biochem. Jour., 18 (1924), No. 5, pp. 800–805*).—In studying the nature of fetal resorption, it was found that rat and mouse embryos and one pig embryo

incubated at 37° C. in sterile Ringer's solution were reduced practically to skeletons in from 7 to 8 days. The membranes and placentas were included in the tubes with the fetuses and were likewise disintegrated, but the process appeared to begin in the fetus and go on more rapidly especially in the liver. Chemical examinations of the solution showed the presence of amino acids and peptones. The addition of 10 per cent KCN to sterile Ringer-Locke solution prevented the autolytic reaction.

It is concluded that the enzymes causing the fetal resorption in utero are produced by the fetus rather than by the mother. The slower disintegration of the placenta in utero is attributed to its contact with the maternal tissue. Accumulation of the autolytic products tended to inhibit the action, but these products are removed in the uterus by absorption, thus allowing the process to continue practically to completion. The operation of uterine enzymes in fetal resorption is considered doubtful.

FIELD CROPS

A hand book of agronomy, G. W. Patteson, jr., T. C. Maurer, and S. R. Bailey (*Va. Agr. Col. Ext. Bul. 97* (*1925*), *pp. 58*).—The cultural, soil, lime, and fertilizer requirements and varietal leaders of various field crops grown in Virginia are supplemented by general agronomic information.

[Field crops work in Washington], E. G. Schafer, O. E. Barbee, H. M. Wanser, I. M. Ingham, C. E. Hill, H. P. Singleton, and H. J. Jensen (*Washington Col. Sta. Bul. 196* (*1925*), *pp. 25, 27, 46–48, 49–51, 52–56, 59, 60, 62, 63*).—Notes on agronomic investigations (E. S. R., 52, p. 829) continued at the station and substations are given regarding varietal trials with spring and winter wheat, oats, barley, alfalfa, corn, field peas, and sweet potatoes; seeding tests with spring and winter wheat and potatoes; irrigation trials with potatoes and sweet potatoes; time of cutting tests with cereals for forage and alfalfa; study of the effect of alfalfa on cereals following; rotations; and trials of miscellaneous forage crops.

Physiological studies.—Observations at the Adams Substation showed that delayed seeding causes differences in the comparative response of different varieties. Seeded at the beginning of the season the spring wheat varieties in the Australian group are generally earlier than those in the North Plains group, whereas when sown late the North Plains sorts reach maturity sooner than the Australian group. Late rather than early seeding curtails the grand period of growth, but the shortening is not always to the same extent with different varieties nor with a constant ratio between the different parts of the period for the same variety nor with a constant ratio for the same part with different varieties. These tendencies seem chiefly due to the influence of critical photoperiod or photothermalperiod requirements for the different stages of development of the different varieties, and the critical requirements appear peculiar to the locality in which the variety was developed.

Comparative drought resistance of the cereals for this region is influenced by the degree of coordination of the periods and stages of growth of the plant with the decreasing soil moisture supply. Their comparative usage of moisture at different growth stages showed Baart, an Australian wheat, better adapted than Marquis and Turkey.

Tillage experiments.—Maximum yields of cereals for both seed and hay have been obtained at Waterville from all systems eliminating volunteer grain and weed growth during the summer fallow year. Outstanding differences in average yields were not obtained between fall plowing (wet or dry), early spring plowing, late spring plowing kept clean by cultivation until plowing,

and summer fallowing by cultivation instead of plowing. It seems advisable to employ a combination of methods distributing the farm labor over a longer period and thereby reducing production cost. Allowing volunteer grain to make a heavy growth in the spring of the summer fallow year for pasturage greatly reduced grain and hay yields. Packing after plowing and also deep plowing increased yields in some years but were probably uneconomical. Cultivating summer fallow more than needed to control weed growth and to prepare a firm level seed bed did not increase yields. The highest yields of winter wheat were from that coming up early in September. Early seeding has also given the best results with spring wheat.

Forage crops, W. D. Albright (*Canada Expt. Farms, Beaverlodge (Alta.) Substa. Rpt. Supt. 1923, pp. 55–91*).—Extensive experiments with forage crops carried on during 6 years at Beaverlodge, Alta., comprised trials of grasses, clovers and alfalfa seeded with cereal nurse crops, comparisons of different combinations of grasses and clovers, seeding tests with grasses and alfalfa, a pasturing test in seeding down, seed production studies with alfalfa, sweet clover, and grasses, and variety trials with corn, millet, sunflowers, swedes, turnips, mangels, and sugar beets.

Seeds mixture experiments in west and central Wales, 1915–1925, R. G. Stapledon and W. Davies (*Univ. Col. Wales, Aberystwyth, Agr. Dept., Advisory Bul. 1 (1925), pp. 64*).—The cooperative experiments with forage crops here detailed were carried on at different centers in Wales and embraced comparisons of mixtures, studies of the effect of rye grass on white clover, red clover, and on orchard grass, nationality trials of red clover, and investigations on the improvement of grassland by plowing and reseeding.

[Agronomic studies in England] (*Jour. Natl. Inst. Agr. Bot., No. 4 (1925), pp. 70*).—Experiments reported on by W. H. Parker comprised trials during the period 1921–1924 of the yields and malting values of the new barley varieties Beaven 1920, Webb B, Cambridge 59/120, and Golden Pheasant; trials of Yeoman II wheat (E. S. R., 52, p. 637) and comparative tests of six varieties of spring oats during 1923–24; and maturity and yield trials (E. S. R., 54, p. 35) of first early potatoes in 1924. A further report on the milling and baking quality of Yeoman II wheat (E. S. R., 52, p. 638), by A. E. Humphries and R. Hutchinson, shows that Yeoman II and Selected Yeoman suffered considerably from the unfavorable weather prevailing in 1924, but that in competition with the older forms they retained their distinctive characteristics practically intact.

Field experiments at Rothamsted during 1923 and 1924, [E.] J. Russell (*Jour. Min. Agr. [Gt. Brit.], 32 (1925), No. 5, pp. 393–409*).—The investigations summarized in this article, concerned with the effects of fertilizer treatments on the yield and quality of cereals and potatoes, have already been noted extensively.

[Field crops work in the Central Provinces and Berar, India, 1923–24], J. C. McDougall, G. K. Kelkar, W. Youngman, T. L. Powar, R. G. Allan, J. F. Dastur, and F. J. Plymen (*Cent. Provs. and Berar [India] Dept. Agr., Agr. Stas. South. Circle Rpt. 1923–24, pp. 1–6, 23, 26; West. Circle Rpt. 1924, pp. 3–9; East. Circle Rpt. 1923–24, pp. 1–13; North. Circle Rpt. 1923–24, pp. 3–11, 25–42, 61–65; Expt. Farm, Agr. Col., Nagpur, Rpt. 1923–24, pp. 3–6, 13–15; Agr. Col., Nagpur, Chem., Bot., and Mycol. Research [etc.] Rpt. 1923–24, pp. 17–19; Cent. Provs. [India] Dept. Agr. Rpt., 1924–25, pp. 8–17*).—Investigations with different field crops are reported on in continuation of earlier work (E. S. R., 52, p. 227).

Vegetable fibers other than cotton (*U. S. Tariff Comn., Tariff Inform. Surveys [Pub.] FL–16 (1925), pp. VIII+92*).—Descriptions, uses, production,

and preparation methods, the commercial movement with reference to the United States, and the tariff status are given for flax, hemp, crin vegetal, jute, jute butts, sunn, ramie, coir, istle, manila, sisal, henequen, maguey, New Zealand flax, kapok, pulu, and minor miscellaneous fibers.

The effect of some legumes on the yields of succeeding crops, T. L. Lyon (*New York Cornell Sta. Bul. 447 (1925), pp. 20, pls. 5, figs. 11*).—The effects of red clover, alsike clover, alfalfa, sweet clover, vetch, soy beans, field peas, and field beans on the growth of succeeding nonleguminous crops were tested.

When nitrogen was the limiting factor, red clover was superior to either timothy or rye in promoting the growth of succeeding crops during 4 years. Clover was most marked in effect the first year after turning under. Timothy was no better than rye in its effect on crop yields during the following 4 years.

Alfalfa stubble and roots when plowed under produced in comparison with timothy greatly increased crops for 3 years after. Alfalfa was relatively more effective than red clover in its fertilizing properties after the first year. The hay yields were greater when red clover had been seeded with timothy than when timothy had been seeded alone, even when top-dressed with 100 lbs. of sodium nitrate.

Red clover, alsike clover, sweet clover, and alfalfa differed little in their effects on the yields of succeeding crops when nitrogen was the limiting factor, although all were more effective than soy beans or field beans grown for grain, or than hairy vetch or field peas grown in mixture with wheat or oats. When a peas-oats mixture followed red clover, no advantage was gained in crop production from the use of the peas, whereas when timothy or a cereal preceded the mixture a material advantage was derived.

Red clover seeded with wheat and with rye and allowed to grow after the cereal was cut until spring plowing for oats caused greater yields of each of four crops in a rotation wherein the clover occurred twice than in a similar rotation omitting clover. A 5-year rotation containing two courses of red clover cut for hay gave larger yields of the last two cereal crops in the rotation than a 5-year system with one course of clover. A similar comparison with one and two courses of timothy hay showed no benefit to the last two cereal crops from the use of two courses of timothy.

Effect of sulfur upon nitrogen content of legumes, J. R. Neller (*Indus. and Engin. Chem., 18 (1926), No. 1, pp. 72, 73*).—Application of sulfur and gypsum to alfalfa on Ritzville and Palouse loam at the Washington Experiment Station resulted in yield increases ranging from 49.3 to 81.1 per cent and increases in the nitrogen content of the alfalfa varying from 32.7 to 44.2 per cent. Since this increase in nitrogen occurred in crops much increased in yield, apparently sulfur caused a very marked increase in nitrogen fixation. Similar results for alfalfa and clover were obtained in other experiments. It seems that sulfur indirectly affects legumes through its direct action or effect upon the nitrogen-fixing organisms.

The culture of lucerne, W. S. Hill (*Auckland and London: Whitcombe & Tombs [1925], pp. [10]+268, pl. 1, figs. 48*).—This practical handbook, designed for New Zealand conditions, treats of the environmental and cultural requirements of alfalfa, its management, utilization, and pests.

Climate and the clover crop, F. A. Welton and V. H. Morris (*Jour. Amer. Soc. Agron., 17 (1925), No. 12, pp. 790–800, figs. 5*).—Statistical data presented in this contribution from the Ohio Experiment Station indicate that under Ohio conditions an increase in clover yields does, within limits, follow an increase in total rainfall for the months of April, May, and June, an increase in

cloudiness for the months of April, May, and June, an increase in total snowfall, an increase in temperature for the months of March and April, and a decrease in temperature for the months of May and June.

Cloverseed for Indiana farms, A. T. Wiancko (*Indiana Sta. Circ. 131 (1926), pp. 4, figs. 2*).—Attention is called to the shortage of native red clover seed, and the results of tests are cited which show that Italian clovers are practically worthless for the climatic conditions. Chilean clovers also appear to be seriously lacking in adaptation and should not be used. Central European clovers are considerably better but are winterkilled about 25 per cent, which might be offset somewhat by thicker seeding. The northern European and Canadian clovers are practically equal to the native. While most foreign clover seeds are of good quality and produce good stands, they can not be judged for winter hardiness by the appearance or germinating quality of the seed.

Reports on the research work carried out at the Cotton Experiment Station, St. Vincent, West Indies, L. H. Burd (*Empire Cotton Growing Rev., 2 (1925), No. 3, pp. 225–236, pls. 2, figs. 3*).—Observations on the influence of rainfall on the lint length of Sea Island cotton indicate that in St. Vincent (E. S. R., 53, p. 336) the mean maximum lint length of a strain is seriously depreciated by a heavy fall of rain about 19 days after flowering. Apparently as little as 0.2 in. may suffice. In spacing experiments with Sea Island cotton according to a method resembling that outlined by Harland (E. S. R., 53, p. 230), and using rows 4 ft. apart with plants from 3 ft. 3 in. to 5 in. apart, the true optimum spacing appeared to be 17 in. at 1 plant per hill and about 19 in. with 2 plants per hill. Study of border effect suggested that elimination of outside plants only is inadequate for the exclusion of marginal errors in plat experiments, and that for cotton in St. Vincent all plants closer than 7 ft. to the margin should be discarded.

Cotton culture in Argentina [trans. title], N. E. Winters (*Min. Agr. [Argentina], Secc. Propaganda e Informes Circ. 539 (1925), pp. 78, figs. 27*).—More elaborate than an earlier publication (E. S. R., 52, p. 734), this manual discusses the soil and climatic needs of cotton, breeding, cultural, and harvesting methods, seed, varieties, and rotations. Important insects and diseases attacking the crop are described, and control methods are suggested.

***A* botanical study of the flax plant.—VI, Manurial pot experiments with flax,** K. Warington (*Linen Indus. Research Assoc., Research Inst. Mem. 29 [1925], pp. 29–36*).—Experiments with flax at Rothamsted demonstrated the importance of a plentiful supply of phosphates, the beneficial effect of potassium, and the possibility of harm from an excess of nitrogen.

The development of the fiber content of hemp (Cannabis sativa) in relation to different growth conditions [trans. title], A. v. Lucke (*Faserforschung, 5 (1925), No. 1, pp. 1–36*).—Investigations at the University of Breslau had to do with the effects of fertilizers, cultural methods, and soils on the hemp plant.

In general seed yield and grain percentage increased with enlargement of the stalk diameter. Increasing the rate of seeding or decreasing the distance between rows produced a longer stalk, a smaller diameter, a higher stalk yield, and a smaller seed yield. Fertilizers had equally favorable effects on stalk length and diameter and on yields of seed and stalks. Stalk diameter and seed yield are correlated. The percentage of grain decreased with increased seeding rate, closer rows, and increased fertilization.

The fiber content increased directly with the stalk length and inversely with the diameter. It was therefore augmented by heavy seeding and narrow rows, and contrariwise, diminished by heavy fertilizing. Valuation of hemp on the

basis of stalk thickness appears practicable; with stalks equal in length, the thinner are worth more than the thick.

Correlation of yield of straw and grain in oats in New Jersey, G. W. Musgrave (*Jour. Amer. Soc. Agron., 17 (1925), No. 12, pp. 769–775*).—The grain and straw yields of oats varieties under test at the New Jersey Experiment Stations were compared for the years 1923–1925. The climatic conditions under the latitude of New Brunswick are considered unfavorable for oats production. The general association of large grain yields with low straw yields was shown in the case of oats, 1923 $r = -0.6929 \pm 0.1075$, 1924 -0.4522 ± 0.1335, and 1925 -0.7732 ± 0.1005. No significant relationship between grain and straw production in the barley varieties included in the same series was apparent.

A preliminary note on pineapple fibre, R. O. Bishop and E. A. Curtler (*Malayan Agr. Jour., 13 (1925), No. 9, pp. 293–301*).—Besides about 10,000 fruits, 8.5 acres of Singapore pineapples produced 43,240 lbs. of wet leaf yielding 443.5 lbs. or 1.02 per cent of dry fiber. Stripping the leaves had no apparent effect, nor was the quality of the fiber reduced by delay in handling the leaves. Strength tests and chemical examinations indicated that the fiber possesses a comparatively high tensile strength and is of a high grade. It is fine in staple and lustrous, with a soft silky texture. The investigation did not indicate, however, that the production of this fiber would be very profitable as a commercial enterprise, even as a by-product of canning pineapples.

The influence of soil type on seed potatoes, E. V. Hardenburg (*Potato News Bul., 2 (1925), No. 12, pp. 464–466*).—Continued studies at Cornell University (E. S. R., 53, p. 635) have shown that without exception potatoes grown on muck and upland soils have had whiter flesh, greater mealiness, and better flavor than those from the heavier soils. Although definite conclusions can not be drawn regarding the comparative value of the seed, the lighter, better aerated soils employed seem better adapted to seed production than the heavier soils. The prejudice against muck-grown seed potatoes is apparently not warranted.

Comparison of potato yields secured on different soil types with and without fertilizer, B. E. Brown (*Potato News Bul., 2 (1925), No. 22, pp. 472–475*).—Acre increases found due to a 4–10–6 fertilizer in cooperative experiments by the U. S. Department of Agriculture during the years 1923–1925 were as follows: In Maine, on Caribou loam, 109.2 bu.; in New York, on Sassafras loam, 97.8 bu.; in Pennsylvania, on Berks shale loam, 97.5 bu.; in New Jersey, on Sassafras loam, 57.5 bu.; and in Virginia, on Braden fine sandy loam, 70.9 bu. and on Sassafras sandy loam, 50.3 bu.

Potato culture in Scotland (*Scot. Bd. Agr. Misc. Pub. 5 (1925), pp. 77*).—This report of the proceedings of the potato conference held August 20 and 21, 1924, at Edinburgh, includes the following papers:

Survey of the Work of the Board of Agriculture for Scotland in the Certification of Potato Stocks and the Registration of Immune Varieties, by J. Wood; Field Trials of Potato Varieties, by J. A. S. Watson; The Classification of Varieties of the Potato, by A. Millar; Practical Effects of Degenerative Diseases and Variations on Potato Stocks, by T. Anderson; Potato Diseases, by G. H. Pethybridge; and Potato Breeding, by J. M. F. Drummond.

The beet sugar industry of Nebraska as a response to geographic environment, E. S. Anderson (*Econ. Geogr., 1 (1925), No. 3, pp. 373–386, figs. 13*).—According to this contribution from the University of Nebraska, the beet-sugar industry has responded favorably to the climatic conditions of Nebraska, rainfall excepted. Lack of moisture has been remedied by irrigation. The well-drained, fertile soils of the terraces of the larger rivers pro-

duce beets of good size and shape and a high sugar content. The intensive cultivation required for beet production together with crop rotation insures the continuation of the soil fertility and successful crop production.

Intensive sugar beet culture, J. Graftiau (*La Culture Intensive de la Betterave a Sucre. Brussels: Oscar Mayolez & Jules Audiarte, 1925, pp. 118, figs. 11*).—This is a practical treatise on the sugar beet in Belgium and its environmental and cultural requirements, giving special attention to fertilizers and their application.

Sugar cane seedling optimum culture, R. L. Davis (*Planter and Sugar Manfr., 75 (1925), Nos. 19, pp. 367, 368, fig. 1; 20, pp. 389–391, figs. 5*).—Experiments involving the varieties G. C. 1486 and St. Croix 12/4 were made at the Porto Rico Experiment Station to determine optimum growth conditions for sugar cane seedlings prior to transplanting into the field.

A summary of the observations indicated that the best time for collection of cane arrows varies with the locality and variety. Cane seed should be planted immediately after collection, since 3 days' storage may cause serious loss in vitality. The best seeding rate is about 2 arrows per square foot or slightly less than 0.25 in. in depth of arrow layer when wet down. A light dirt covering for the fuzz improves the stand, affording protection against drying out. Watering germination flats to saturation once or twice a day gives good results. Shading from direct sunlight during the mornings of the first 2 weeks after transplanting retards growth without decreasing mortality. A soil depth of 6 in. in the germination flats gives much better growth during the first month than 3-in. soil depth. Soil mixtures for transplanting purposes are compared. For low mortality and ease of handling, 60- to 70-day old seedlings (3 to 5 in. in height) are best for transplanting.

Sweet clover, A. T. Wiancko (*Indiana Sta. Circ. 130 (1926), pp. 8, figs. 2*).—A popular discussion of the varieties, soil, and cultural requirements, uses, and management of sweet clover. Results at the station indicated that sweet clover is not as desirable as either red clover or alfalfa as a hay crop in a 3-year rotation with corn and wheat.

Havana seed tobacco as influenced by timothy cover crop, J. P. Jones (*Massachusetts Sta. Circ. 73 (1925), pp. 3*).—Tobacco yields on plats having had a timothy cover crop were consistently lower than those without cover, and while the quality was about the same, a higher proportion of longer leaves was found in the no-cover crop. In another experiment, for four consecutive years the timothy cover consistently failed to increase yield and to improve quality. It seems that the timothy cover crop should be used cautiously by the tobacco growers, especially where the presence of brown root rot is suspected.

The quality and yield of tobacco as influenced by manurial and other operations, J. N. Mukerji (*India Dept. Agr. Mem., Chem. Ser., 8 (1925), No. 1, pp. 26*).—Experiments with tobacco at Pusa Institute may be summarized as follows:

I. *The effect of manures and fertilizers on the yield, quality, and nicotine content of tobacco.*—Superphosphate or saltpeter used alone did not seem effective for tobacco in Pusa soil, whereas a complete mineral fertilizer gave excellent results. The presence of potassium in the fertilizer has regularly increased the yield. The maximum total yield is produced by a fertilizer containing a higher phosphorus: nitrogen ratio than is found in ordinary farmyard manure. On account of their cheapness, availability in Bihar, and effectiveness, manure and indigo "seeth" lead as tobacco fertilizer.

The quality of tobacco so far as texture, color, and body are concerned was not related to the fertilizer treatments or to the richness of the fertilizers

used. The ash, amido nitrogen, and albuminoid nitrogen were scarcely affected by the several fertilizer treatments. Chemical fertilizers generally gave a higher, and organic fertilizer such as farmyard manure or indigo "seeth," a lower potash content. Application of potassium chloride considerably increased the chlorine content, while other fertilizers had slight effect thereon. Tobacco fertilized with saltpeter burned quickly when smoked, whereas that receiving superphosphate burned poorly and slowly. However, a combination of these minerals produced tobacco with a fair burn.

On the whole, the results clearly indicated that the nicotine content of tobacco is generally proportional to the yield, i. e., to the growth of the tobacco.

II. *The effect of "topping" and "spiking" on the yield and quality of tobacco.*—Experiments during two years showed almost identical yields of tobacco leaves by topping and spiking. In comparison with spiking, topping increased the outturn of stalk and stem and produced a better tobacco, which was of superior burning quality and suitable for cigars and cigarettes. Topped and spiked tobacco differed little as to their ash, potash, chlorine, and protein contents, although topped plants generally had more nicotine.

III. *Ground curing and rack curing.*—Curing studies demonstrated that rack curing produces tobacco of a bright yellow color quite suitable for cigarettes, while ground curing gives leaf of dark brown hue. Rack-cured leaf is more elastic than ground-cured leaf and hence is better for cigarettes, and has a reduced nicotine content, especially the volatile nicotine, and a higher starch content.

[Tobacco studies in Nyasaland], A. J. W. Hornby (*Nyasaland Dept. Agr. Ann. Rpts. 1923, pp. 26–33; 1924, pp. 26, 27*).—The reported investigations include studies of tobacco soil types and varietal adaptation, variety and fertilizer trials, studies of seed bed management, and curing tests.

Results of experiments in the use of intertilled crops vs. fallow as preparation for wheat production in Saskatchewan and western Manitoba, M. Champlin and T. M. Stevenson (*Jour. Amer. Soc. Agron., 17 (1925), No. 12, pp. 807–812*).—The yields of crops grown in rows and wheat yields following various fallow substitutes and fallow at several experiment stations in Canada (E. S. R., 52, p. 226) are tabulated for periods of several years. While the results do not indicate the safety of yet completely abandoning the summer fallow, even if labor conditions permit in districts represented by any of the stations, they suggest that ways are being found to replace part of the fallow with intertilled crops, thus furnishing the basis for practical crop rotations.

Some effects of moisture on wheat, E. A. Fisher (*Research Assoc. Brit. Flour-Millers Bul. 3 (1925), pp. 54, pls. 2, figs. 17*).—This résumé of available literature deals with the relation of moisture content of wheat to the market and milling quality of the grain, and the relation of moisture to the heating of wheat. No bibliography is included.

[Garnet wheat] (*Sci. Agr., 6 (1926), No. 5, pp. 167, 168*).—According to a statement from the cereal division of the Dominion of Canada Department of Agriculture, Garnet wheat, derived from Preston × Riga wheat, appears to combine the "strength" and earliness of Riga with the yielding ability of Preston to a considerable extent, and shows some indication of having inherited the drought resistance of Preston. While Garnet seems susceptible to rust, its earliness in ripening may frequently enable it to escape the effects of this disease. Garnet has ranked high in yields in comparative tests on the Dominion Experimental Farms. Flour of the new variety appears to possess plenty of "strength," although it does not have the extreme whiteness dis-

tinguishing Marquis. It is expected that Garnet will at least supplant Ruby as an early maturing variety.

Results of seed tests for 1925, M. G. EASTMAN (*New Hampshire Sta. Bul. 220 (1925), pp. 19*).—Tabulations show the percentage of germination and purity for 355 official samples of agricultural seed collected in New Hampshire and tested during the year ended June 30, 1925.

Agricultural seed inspection, A. S. LUTMAN (*Vermont Sta. Bul. 253 (1925), pp. 3–16*).—The purity, guaranty, percentage of germination, and number of weed seed per pound are tabulated for over 300 samples of agricultural seed obtained from local dealers in Vermont during April and May, 1925.

Work on hard seed problem to date, D. SCHMIDT (*Seed World, 19 (1926), No. 1, p. 9, fig. 1*).—Results of cooperative field trials in continued studies (E. S. R., 51, p. 34) indicate that with seedings made in late fall, midwinter, or very early spring and exposed to freezing and thawing for some time, the germination of hard seeds of alfalfa is very slight, hard seeds of sweet clover 40 or 45 per cent, and of red clover, white clover, and alsike about 15 or 20 per cent. If sown just after the frost has left the soil, most of the hard seeds of alfalfa will germinate, while only about 10 or 15 per cent of those of red clover, white clover, alsike, and sweet clover will germinate during the first season. When sown in late spring or midsummer, the germination of hard seeds is very low.

[Weed studies], H. T. GÜSSOW (*Canada Expt. Farms, Div. Bot. Rpt., 1924, pp. 15–17*).—Seed of wild morning glory from old vines is indicated as a potential source of infestation. Dry salt, brine, or sodium arsenite sprays were not practicable in controlling mouse-ear hawkweed (*Hieracium pilosella*) in lawns. Shallow plowing and prevention of seed maturing may be necessary for its control. Iron sulfate solution was the best of several herbicides tested on dandelions. Dry salt on lawn and pasture weeds, e. g., daisy fleabane, common plantain, self-heal, and king devil, gave fair results early in the season while the leaves were spread out on the ground, but the loss of these leaves was ineffective with plants pushing up stems.

Some recent weeds in the south-western counties, E. W. FENTON (*Jour. Min. Agr. [Gt. Brit.], 32 (1925), No. 7, pp. 630–635*).—Weeds described as recent in several of the southwestern counties of England include hawk's beard (*Crepis* spp.), rayless mayweed (*Matricaria discoidea*), and soft knotted trefoil (*Trifolium striatum*). Their life history, distribution, and control methods are outlined.

Weeds in the rice fields and their effect on the yield of grain, B. C. CABAILO (*Philippine Agr., 14 (1925), No. 6, pp. 359–371, figs. 3*).—Rice grown experimentally under the caiñgin, upland, and lowland systems hoed three times and hand weeded twice during growth averaged 26.3, 30, and 44 cavans per hectare (22.67, 25.86, and 37.94 bu. per acre, respectively); weeded once 15.2, 28, and 36.3 cavans, and not weeded 10.7, 18, and 32.3 cavans. The weight of straw was proportional to the grain yield.

The dominant species in the caiñgin field in order of abundance were *Synedrella nodiflora*, *Mimosa pudica*, *Imperata cylindrica koenigii*, *Saccharum spontaneum indicum*, and *Paspalum conjugatum*; in the upland field *Amaranthus spinosus*, *Synedrella nodiflora*, *Malachra capitata*, *Eclipta alba*, and *P. conjugatum*; and in the lowland field *Panicum crus-galli*, *Cyperus difformis*, *Monochoria vaginalis*, *Fimbristylis complanata*, and *S. nodiflora*.

Ninety-four species considered troublesome weeds in Philippine rice fields are listed.

Some hosts of lucerne dodder (Cuscuta chinensis), G. B. PATVARDHAN (*Poona Agr. Col. Mag., 17 (1925), No. 3, pp. 152, 153*).—Alfalfa dodder has been

observed to attack niger seed (*Guizotia abyssinica*), *Pennisetum typhoideum*, *Setaria glauca*, *Andropogon annulatus*, *Dolichos biflorus*, and a number of weeds in the Poona District near Bombay.

HORTICULTURE

[Horticultural investigations at the Washington Station] (*Washington Col. Sta. Bul. 196 (1925), pp. 18, 30, 31, 32, 61, 62*).—Continuing work noted in the preceding report (E. S. R., 52, p. 837) upon the chemical changes accompanying maturity in the apple, J. R. Neller, J. L. St. John, and R. R. Rowell report that in storage the acid content of Grimes apples decreases much more rapidly than that of Jonathans. Marked differences in starch content were found in stored apples in relation to the date harvested and the kind of storage utilized. In all three varieties used in the test, Grimes, Jonathan, and Delicious, the alcohol-insoluble invert material and pectin decreased in storage. Considerable difference was found in the composition of the three varieties. Jonathan contained the least and Grimes the most pectin. Grimes contained the least invert and total sugars, and Jonathan contained considerably less alcohol-insoluble invert material than did either Grimes or Delicious. The Delicious contained far less acid, both active and total, than did the other two varieties.

That cover crops are important factors in maintaining orchard soil fertility was indicated in studies conducted by O. M. Morris, H. J. Jensen, and W. A. Luce. The application of commercial fertilizers to irrigated soil which had been growing cover crops for four years or more failed to show any benefit in tree growth or in quantity or quality of the fruit. Measurements on trees cover cropped for seven years or more showed them to be making the maximum growth consistent with high productivity. Frequently the heavy foliage interfered with the attaining of high color and satisfactory appearance.

Work conducted by Morris, F. L. Overley, and Jensen showed the hardness of apples to be correlated with maturity and the pressure test to be a reliable index to hardness and, hence, to maturity. Morris and Luce, working near Wenatchee, found the Winesap to be practically self-sterile, but satisfactorily pollinated by Jonathan or Rome.

Observations by Jensen upon the changes in size of ripening apples showed the greatest growth to occur during the first two or three weeks of the picking season. Color also increased rapidly during this period. The removal of part of the fruit from a Delicious tree resulted in a more rapid increase in the remaining fruits than occurred on an unpicked tree, and, at the same time, the fruit of the partially harvested tree clung more tenaciously.

Better seed for commercial vegetable growers, P. Work (*N. Y. Agr. Col. (Cornell) Ext. Bul. 122 (1925), pp. 22, figs. 5*).—Urging the importance to vegetable growers of using only carefully grown and selected seed, the author suggests the desirability of locating reliable sources of seed and in addition, wherever possible, of making tests one year in advance of regular planting. The production of high-grade seed is expensive, warranting a high initial cost. Home production may result in ideal seed, yet the labor and difficulties involved frequently offset the advantages.

Growing early cabbage, A. B. Fite (*New Mexico Sta. Bul. 151 (1926), pp. 16, figs. 3*).—This is a presentation of general information on the production of early spring cabbage under irrigation in the valleys of southern New Mexico.

Hubbard squash in storage: Climate of storage rooms and changes in composition, M. B. Cummings and E. W. Jenkins (*Vermont Sta. Bul. 251 (1925), pp. 3–35, pl. 1, figs. 11*).—Five seasons' records taken on the keeping

of squash stored under various environmental conditions, subject to measurements by thermograph and hygrograph, showed that the best results were obtained in a relatively cool and comparatively dry atmosphere. Packing squashes in sawdust had no apparent effect on keeping quality but promoted a uniformity in temperature. Dipping squashes in Bordeaux mixture had no influence in retarding loss in weight due to shrinkage. High temperatures induced heavy losses in weight; for example, in 1921 tests squashes stored in a boiler room, where the temperature averaged 74° F., lost 63 per cent in weight from September 12 to February 24, whereas other squashes stored in an attic room with an average temperature of 55° lost only 20.1 per cent in the same period.

Chemical determinations by C. H. Jones showed, in general, that as the storage period advances there is a gradual increase not only in the percentage of water but also in the percentage of protein in the dry matter, suggesting that shrinkage may be largely attributed to depletion in carbohydrates used in maintaining the life processes. A loss in table quality accompanied a loss in carbohydrates and an increase in water.

Of several organisms, namely, Fusarium, Mucor, and Cladosporium, found to cause decay in stored squashes, the first named, usually distinguished as a hard, dry rot, was the most frequent cause of decay. The authors suggest that decay may be quite largely prevented by careful handling during harvest and storage.

Effect of phosphorus upon the yield and time of maturity of the tomato, J. R. Hepler and H. R. Kraybill (*New Hampshire Sta. Tech. Bul. 28 (1925), pp. 43, figs. 14*).—Records taken at Arlington, Va., in 1918 and at Durham, N. H., in 1920–1924 upon tomato plants fertilized with various materials indicated that acid phosphate has a distinctly stimulating effect on the production of early ripe fruits.

At Arlington, Kraybill found that Stone tomatoes receiving, on the acre basis, 1,500 lbs. of acid phosphate in addition to 20 tons of manure ripened 21.5 per cent of their fruits by August 19, as compared with 11.2 per cent for manure alone and 12.2 for manure plus 1,000 lbs. of potassium chloride. At the same time the difference in total yield of the manure and manure plus phosphate plats was less than 2 per cent.

Records taken at Durham upon blossom and blossom cluster formation and upon the vegetative growth of plants showed that acid phosphate stimulates the rapid early development of the plant, with the result that a much larger number of blossom clusters are produced early. Regardless of fertilizer treatment, the number of blossoms per cluster and the size of the fruits were approximately equal on all plats, with some slight indication that phosphated plants set a larger proportion of fruit for a given number of blossoms. No evidence was found that acid phosphate or any other fertilizer ingredient affected the length of time from blossoming to maturity. The use of extra manure increased total but not early yields. Gypsum had a slight hastening effect on maturity. Potash when used with acid phosphate and manure reduced the stimulating effect of the phosphate. In 1924 potash used with manure alone significantly reduced the yields below those of manured plants. Plants treated with acid phosphate were paler green in color than those treated with manure or with manure plus potash.

The fruit-grower's guide, J. Wright, rev. by H. J. Wright (*London: Virtue & Co. [1925?], rev. ed., vols. 1, pp. XVI+336, pls. 12, figs. 219; 2, pp. VII+337–682, pls. 12, figs. 155*).—This comprehensive guide, illustrated in part in color, presents detailed information on the propagation, planting, pruning, culture, etc., of fruits, melons, etc.

Some chemical constituents of fruit spurs associated with blossom bud formation in the Baldwin apple, H. R. KRAYBILL, G. F. POTTER, S. W. WENTWORTH, P. T. BLOOD, and J. T. SULLIVAN (*New Hampshire Sta. Tech. Bul. 29 (1925), pp. 3–41+XIII, figs. 20*).—A comparison of the results of chemical analyses of bearing and nonbearing spurs collected on 15 different dates in the 1921 growing season from Baldwin apple trees located on unfertilized sod and on a highly fertilized tilled plat in the Woodman experimental orchard (E. S. R., 41, p. 43), with actual flower-bud formation during the same season, showed certain limitations to the general application of the carbohydrate-nitrogen theory advanced by Kraus and Kraybill (E. S. R., 40, p. 40). For instance, while the bearing spurs on the sod plat and the nonbearing spurs on the fertilized plat were found approximately similar in chemical composition, the percentages of spurs to form flower buds in 1921 were 0 and 42.4 per cent, respectively. The authors suggest three possible explanations for this inconsistency, (1) the dominance of the fruit in the bearing spurs causing a suppression of flower-bud formation, (2) differences in availability of the nitrogen contents, and (3) the localization of food materials.

Although certain chemical differences appeared to be correlated with differences in abundance of fruit buds formed in the four sets of spurs, these differences were for the most part in the contents of compounds not usually deemed to be physiologically active. After June 1 the starch content was considerably greater in nonbearing spurs of the sod plat (10.4 per cent producing flower buds) than in the nonbearing spurs of the fertilized plat (42.4 flower-bud spurs), thus indicating that flower-bud formation is not dependent wholly, or even largely, on starch accumulation. The total carbohydrate contents closely approximated those of starch. Nitrogen was highest in the fruiting spurs of the fertilized plat, lowest in the nonfruiting spurs of the sod plat, and approximately equal and intermediate in the bearing spurs of the sod plat and nonbearing spurs of the fertilized plat. The phosphorus content was lowest in the nonbearing spurs of the fertilized plat. Ash was highest in the nonbearing spurs of the sod plat. Under similar cultural conditions, fruit-bearing spurs were lower in starch and total carbohydrates and higher in nitrogen than were nonbearing spurs.

Interpreting the performance of the apple tree, M. J. DORSEY (*Ill. State Hort. Soc. Trans., 59 (1925), pp. 155–165*).—Certain attributes, such as leaf color, character of growth, amount of bloom, and size of fruit are considered by the author to be valuable indicators of the nutritional condition of the apple tree and to be of service in suggesting necessary cultural, pruning, and fertilizer treatments.

The effect of drought on apple trees, W. A. RUTH (*Ill. State Hort. Soc. Trans., 59 (1925), pp. 106–126*).—Recording the frequency and duration of dry periods in southern Illinois, the author discusses the various deleterious effects that such droughts have on orchards. Certain remedial measures, such as improved drainage to relieve the shallow-rooting tendency of water-logged trees and the application of correct orchard management practices in pruning, cultivating, and fertilizing are recommended as of likely value in mitigating the evil effects of summer droughts.

The Jonathan apple in cool storage, J. E. HARRISON (*Jour. Dept. Agr. Victoria, 24 (1926), No. 1, pp. 31–38, figs. 3*).—Observations on Jonathan apples stored at 32, 34, and 37° F. showed that 37° is the most favorable temperature, no soft scald developing and much less internal breakdown occuring than at 32 or 34°. However, there was a greater development of mold and Jonathan spot at the highest temperature. Fruits taken from exposed and shaded portions of the same tree showed no differences in their keeping quality. Observations

on the keeping quality of Jonathan apples harvested at different dates indicated that there is an optimum time for picking, when the fruit is neither too green nor too ripe. It is suggested that Jonathan spot is likely associated with lenticel injury due to overexposure to extreme sunlight.

The apple and peach industries of Virginia, H. M. TAYLOR and F. E. PARSONS (*Va. Dept. Agr., Survey Bul. 1 (1926), pp. 85, figs. 18*).—Compiled jointly by the U. S. D. A. Bureau of Agricultural Economics and the Virginia Department of Agriculture, this bulletin discusses the commercial fruit-growing industry of Virginia with reference to historical development, present acreage, production, exports, varieties, storage facilities, etc.

The cranberry industry in Massachusetts, C. Y. MASON (*Econ. Geogr., 2 (1926), No. 1, pp. 59–69, figs. 10*).—A compilation of information, pointing out how a combination of favorable factors, such as climate, soil, flooding facilities, and a strong marketing agency, have united to place Massachusetts cranberry production on a sound economic basis.

Strawberry culture in Pennsylvania, S. W. FLETCHER (*Penn. State Col. Ext. Circ. 106 (1925), pp. 16, figs. 4*).—Noting the present situation in strawberry growing in Pennsylvania and the great possibilities for profitable expansion, the author discusses general cultural requirements, varieties, marketing, etc.

Inheritance studies with the grape [trans. title], R. SEELIGER (*Ztschr. Induktive Abstam. u. Vererbungslehre, 39 (1925), No. 1, pp. 31–163, figs. 27*).—A detailed report upon grape breeding studies conducted at the Naumburg Branch Station, where an extensive collection of native and foreign grape species and varieties has been assembled. Among the many factors considered are inheritance of disease resistance, chlorotic condition, shoot formation, tendrils, sex, leaf shape and color, berry color, juice color, and date of blossoming.

In crosses between varieties of *Vitis vinifera*, the F_1 generation was usually intermediate between the parents in respect to time of blooming. Red color was dominant over green or yellow in the leaf. A marked correlation was found between berry color and leaf color—in general the darker the berry the greater the intensity and amount of red autumn coloration in the leaves. In respect to vigor of the seedlings, those of vinifera parentage were observed to be weak as compared with those of other species.

A study in sex change in papaya and of correlation between sex and certain morphological characters of seedlings, T. P. REYES (*Philippine Agr., 14 (1925), No. 7, pp. 391–412, pls. 3*).—Attempts to correlate vegetative characters with sex in immature papaya plants were unsuccessful, despite the current belief among growers that this is possible. Apparently the preponderance of fruit-bearing trees in orchards near Los Banos is due mainly to the fact that seed of hermaphrodite elongata fruits are used for planting.

The removal of the top limbs of 88 male trees resulted in no change in sex expression in 87 of the individuals. In the single plant that was affected the change in sex was incomplete and very temporary. Pruning caused no changes whatsoever in the sex of female papaya plants. Cutting off the central root system had no influence upon the normal sex ratio in seedlings, and the time of pruning had no effect whatsoever.

A report on sterility in irises, L. A. COVER, M. R. SWABEY, and A. B. STOUT (*Amer. Iris Soc. Bul. 16 (1925), pp. 38, figs. 7*).—Based on data obtained in the exhibition gardens and laboratories of the New York Botanical Garden and unpublished records compiled by G. Sturtevant, there are presented herein tabulated lists of iris varieties, showing the ability of each to produce seed when fertilized with pollen of established viability, and also notes upon the

character of the pollen as determined by germination studies. In addition a record is given of pollinations made at the garden, with the results indicated. In general, iris varieties are separated into four classes: (1) Varieties highly fertile, both as seed and pollen parents, (2) varieties having only fertile pollen, (3) varieties that are pollen sterile but able to set seed, and (4) varieties that are sterile both in respect to pollen and seed production.

Lilies, A. B. STOUT (*Jour. N. Y. Bot. Gard., 26 (1925), No. 309, pp. 203, 204*).—In this brief abstract of an illustrated lecture, the author enumerates 15 species of true lilies which, with moderate care, may be grown successfully outdoors in the latitude of New York City.

New day lilies, A. B. STOUT (*Jour. N. Y. Bot. Gard., 26 (1925), No. 308, pp. 169–178, figs. 3*).—Breeding work at the New York Botanical Garden with several species of Hemerocallis has resulted in the development of several promising new varieties.

FORESTRY

Constructive forestry for the private owner, J. J. CRUMLEY (*New York: Macmillan Co., 1926, pp. XVIII+322, figs. 80*).—This text, discussing the principles and practices of forestry, is designed for the use of schools and for private owners.

Forest management, A. B. RECKNAGEL, J. BENTLEY, JR., and C. H. GUISE (*New York: John Wiley & Sons; London: Chapman & Hall, 1926, 2. ed., rev., pp. XVII+329, pls.* [2], *figs.* [22]).—This is a thoroughly revised edition of a previously noted work (E. S. R., 41, p. 540).

The forestry primer, 1876–1926, C. L. PACK (*Washington, D. C.: Amer. Tree Assoc., 1926, pp.* [32], *figs. 14*).—Prepared in a form suitable for school children, this pamphlet presents a graphic picture of the forestry situation in the United States, outlining the necessity of action in replanting cut-over areas and in conserving existing forests.

Types of peat and their connection with afforestation, A. C. FORBES (*Empire Forestry Jour.* [*London*], *4 (1925), No. 2, pp. 187–205*).—Five types of peat, namely, turf, heath, mountain, sphagnum, and marsh, are distinguished by the author and the forestry values of each discussed. Plantings on mountain peat above 1,000 ft. elevation and on sphagnum peat at all levels are deemed to be predestined to failure unless accompanied by expensive preparation, including the application of artificial manures. On turf and the thinner heath types the choice of suitable forest species is likely to lead to satisfactory results. Marsh peat gives satisfactory results when drainage is provided and the sphagnum upper layers removed. The author believes that peat formation is constantly in progress on the poorer soil types of the British Isles.

Studies of Connecticut hardwoods: The treatment of advance growth arising as a result of thinnings and shelterwood cuttings, L. J. LEFFELMAN and R. C. HAWLEY (*Yale Univ. School Forestry Bul. 15 (1925), pp. 68, figs. 17*).—Studies of the amount, character, and distribution of reproduction in Connecticut hardwood stands located on well-drained soils in the vicinity of New Haven indicated that the future stand will be predominately oak, red oak dominating on the better quality sites and chestnut oak on the poorer quality locations. In respect to rapidity of height growth, red maple was found to be a serious competitor to the oaks, being responsible for nearly all the suppression occurring in the latter species. Seedlings, because of their well-distributed root systems, are deemed more desirable elements in the young stand than

sprouts, which have a tendency to decay as a result of their contact with the old tree roots. Young trees of undesirable form were observed to often improve in the competition of close stands. The future stand in this area will be fully stocked with at least one-half the area occupied by oak of the better growth forms. The authors believe that red maple will slow down in growth during middle age and occupy in the mature stand an intermediate or codominant position in the crown canopy.

As a result of the studies it is recommended that the advance growth be protected during logging operations and later culled of deformed, flat-topped individuals and dominant stems of inferior species.

Pines in the prairie, F. C. GATES (*Ecology, 7 (1926), No. 1, pp. 96–98*).—That pines can survive under the prairie conditions of Riley County, Kans., was indicated in a survey which showed the presence of many scattered groves serving as windbreaks or ornamental plantings. The two most important species were *Pinus sylvestris* and *P. banksiana*, with *P. laricio* and *P. ponderosa* present in less numbers. Rapid reproduction of pines is believed to be hindered by the difficulty of the germinating seed in penetrating the tough prairie sod and also by the prevalence of severe, dry winter winds which are peculiarly destructive to young seedlings. However, by establishing plantings with strong stock and giving a little care at the start, the author believes that pines may be successfully planted in this locality.

[Broadleaf forest species in Finland], V. KUJALA (*Commun. Inst. Quaest. Forest. Finland. No. 7 (1924), pp. 1–50, figs. 3*).—Phenological data are presented upon the length of the foliage period and the time of flowering in certain broadleaf species.

Two new trees from Chekiang, W. Y. CHUN (*China Jour. Sci. and Arts, 4 (1926), No. 1, pp. 41–43, pls. 2*).—Of several hitherto undescribed forest tree species found in a recent expedition into the Province of Chekiang, China, conducted by the National Southeastern University of Nanking, two species were considered of particular importance, *Halesia macgregori* n. sp., the first member of the genus to be found outside of America, and *Torreya jackii* n. sp., of note because of its close resemblance to the California species *T. californica*.

The forests of Cyprus, D. J. W. HAMILTON (*Empire Forestry Jour.* [*London*], *4 (1925), No. 2, pp. 235–237*).—Pointing out that the forest resources of Cyprus have been practically exhausted by unrestrained fires and exploitation, the author cites preparations being made for reforesting the better sites.

The forests of Papua and New Guinea, C. E. LANE-POOLE (*Empire Forestry Jour.* [*London*], *4 (1925), No. 2, pp. 206–234*).—A brief article discussing the species composition and the distribution of the forests and suggesting a permanent forest policy.

[Progress reports on forest administration in the Jammu and Kashmir State for the years 1922–23, 1923–24, and 1924–25], H. L. WRIGHT (*Jammu and Kashmir* [*India*] *Forest Admin. Rpts., 1922–23, pp. II+19+LIV; 1923–24, pp. V+39+XLIII, pls. 7; 1924–25, pp. V+53+XLIX, pls. 12*).—The activities of the Forest Department during the years reported upon are presented (E. S. R., 50, p. 647), the exploitation of timber resources being especially discussed. The Forest Department was reorganized and enlarged during 1924–25.

Aero-photo survey and mapping of the forests of the Irrawaddy Delta, R. C. KEMP, C. G. LEWIS, C. W. SCOTT, and C. R. ROBBINS (*Burma Forest Bul. 11 (1925), pp. [2]+45, pls. 11*).—Data are presented upon the methods employed and the information obtained in an airplane survey.

Survey of forestry conditions and lumber production in Shansi (*Chinese Econ. Mo., 3 (1926), No. 2, pp. 55–60*).—A short article pointing out that the

greater portion of the Shansi Province is waste land, unsuited to field crops but adapted to forestry purposes, and outlining the present situation throughout the province, citing afforestation activities begun in 1919 in an attempt to reforest the better quality sites.

The organisation and development of a forestry system in New South Wales, R. Dalrymple-Hay (*Empire Forestry Jour. [London], 4 (1925), No. 2, pp. 238–244*).—A discussion of the origin and development of forest activities.

Afforestation methods in New Zealand, M. Sutherland (*Empire Forestry Jour. [London], 4 (1925), No. 2, pp. 245–250, pl. 1*).—Briefly discussing the distribution of forest lands and the difficulties in organized afforestation, the author outlines activities now in progress.

Lumber and allied products (*U. S. Bur. of the Census, Census Manfrs., 1923, pp. VII+94, figs. 3*).—Statistical information is presented on the production of lumber and its products in the year 1923.

DISEASES OF PLANTS

Division of plant pathology (*Washington Col. Sta. Bul. 196 (1925), pp. 32–36*).—Wheat smut investigations by F. D. Heald, in which the comparative efficiency of various seed disinfectants was tested, are said to have given complete control or to have greatly reduced the amount of infection through seed-borne spores, especially where formaldehyde, copper carbonate, copper stearate, copper mercury compounds, and several organic mercury compounds were used. Further studies on the number of spores carried by wheat grains showed spore loads ranging from 16,848 to 30,846 spores per grain from crops yielding from 25 to 70 per cent of smut.

In continuation of a previous report (E. S. R., 52, p. 845) Dana summarizes his investigations on mosaic and related diseases of potatoes and other crops. The witches' broom disease of potatoes was found to be transmitted by grafting, but additional tests are required to verify the preliminary results. Chlorosis or calico is said to be transmitted in the field, but negative results were obtained in experiments on transmission by grafting or by aphids. Selections of giant hills in the varieties Netted Gem and Burbank are said to show the characters of giant hill in tops and spindle tuber in all the tubers produced. Special selections by tuber indexing and field inspection for the control of mosaic and allied diseases are said to have given satisfactory results with Netted Gem, Idaho Rural, and Irish Cobbler, but not with Bliss Triumph. A study made with the character of sprouts appearing on tubers is said to indicate that when infected with witches' broom, leaf roll, and rugose mosaic, and possibly also with spindle tuber, all sprouts start development at the same time, instead of beginning from the eyes at the bud end as in normal tubers. Mosaic was transmitted by aphids from tomato to tomato, and from tomato to potato. In a study of wild hosts as carriers of potato mosaic, probably of the rugose type, the author found that nightshade and Jimson weed did not transmit the disease through their seed.

In a study of winter injury to fruit trees, by Heald and R. Sprague, attention was given to the silver-leaf fungus, *Stereum purpureum*, as a factor in the injury. The results are said to indicate that the fungus makes slow progress in normally active trees, but that it advances rapidly in trees weakened by winter injury.

In connection with a plant disease survey of the State, C. Spiegelberg found *Coryneum ruborum* and an undetermined species of Phomopsis associated with a canker of evergreen blackberries, and Sprague determined *Apiosporina collinsii* to be the cause of witches' broom of the service berry *Amelanchier* sp.

Studies on the influence of some environmental factors on the development of crown gall, A. J. Riker (*Jour. Agr. Research* [*U. S.*], *32* (*1926*), *No. 1, pp. 83–96, pls. 3, figs. 2*).—A report is given of a study of the influence of some environmental factors on plants inoculated with crown gall, as well as investigations on the organism *Bacterium tumefaciens.*

Preliminary experiments with tomato plants showed that the development of crown gall occurred at a low temperature range and that the development of galls was increased in saturated stems as compared with others exposed to the air. Tomato plants which had been inoculated with the crown gall organism were planted in temperature and moisture control tanks, the points of inoculation being below the surface of the soil. The tanks were kept at temperatures of 14, 18, 22, 26, 30, and 34° C., and in each temperature series there were maintained 20, 40, 60, and 80 per cent of the moisture-holding capacity of the soil. The greatest development of crown gall of the aboveground parts of the host was reached at 22 to 30°, with 80 per cent moisture. The largest galls were found at 22° for all moistures and at 60 per cent moisture for all temperatures. Gall development was reduced at 30° and above. The optimum of both temperature and moisture for disease development on the tomato was found to be slightly lower than that for the host plant.

In studies of the critical temperatures of gall formation it was found that at 28 to 30° poorly developed galls were obtained, while none at all developed above 30°. The tomato plants, however, grew well above 30°. Inoculated tomato plants kept in chambers where the air temperature was regulated to 8 to 10° made practically no growth and produced no galls in a month's time.

Similar experiments with raspberries gave inconclusive results but indicated a range of conditions resembling those for the tomato.

Studies of the organism in cultures are described, in which it is shown that on nutrient-dextrose agar the largest colonies were produced in the range of 14 to 30°, while in other media the largest vegetative activities, as well as acid production, occurred over the same range. In tomato decoction the greatest pH change, which was on the alkaline side, occurred at the same temperatures. These conditions are said to be closely correlated with the production of galls in tomato. Tests for precipitins and agglutinins in the host tissue near the galls and in the galls proper gave negative results. The crown gall organism did produce agglutinins when injected into a rabbit.

Interspecific transmission of mosaic diseases of plants, K. H. Fernow (*New York Cornell Sta. Mem. 96* (*1925*), *pp. 3–34, pls. 7*).—A report is given of studies of mosaic diseases of different plants to determine their specific relationship, plants affected if separate strains exist, and symptoms produced by the different strains of virus on susceptible hosts.

Nineteen species of plants, all but four of which belong to genera of Solanaceae, were inoculated under controlled greenhouse conditions with virus from the following sources: A, juice of mosaic tobacco plants that had been kept in a bottle in the greenhouse for several years but was still found to be infective; B, mosaic potato plants; C, mosaic *Datura stramonium;* D, mosaic Nicotiana glutinosa, which developed after inoculation from a *D. stramonium* plant affected with mosaic C; E, mosaic *Phytolacca decandra;* F, mosaic *Rumex obtusifolius;* G, mosaic *Phaseolus vulgaris;* and H, mosaic *Echinocystis lobata.* Field experiments in some instances were used to supplement data from greenhouse grown plants.

It appears that the eight mosaics are distinct, with the possible exception of two, which may prove to be identical. The differences between the mosaics are said to be shown by the species they are able to attack and by the different

symptoms produced by them when inoculated on the same species. They also apparently differ in the ease of inoculation. The susceptible ranges of the mosaics, so far as they were determined, were as follows: Mosaic A, *Lycopersicon esculentum*, *Martynia louisiana*, *N. rustica*, *N. tabacum*, *Physalis heterophylla*, *P. subglabrata*, *Solanum aculeatissimum*, *S. atropurpureum*, *S. carolinense*, *S. nigrum*, and *S. tuberosum;* mosaic B, *D. meteloides*, *D. stramonium*, *L. esculentum*, *Nicandra physalodes*, *Nicotiana glutinosa*, *S. aculeatissimum*, *S. atropurpureum*, *S. carolinense*, and *S. tuberosum;* mosaic C, *D. meteloides* and *D. stramonium;* mosaic D, *N. glutinosa;* mosaic E, *Phytolacca decandra;* mosaic F, *R. obtusifolius;* mosaic G, *Phaseolus vulgaris;* and mosaic H, *E. lobata*, *Nicandra physalodes*, and *Nicotiana glutinosa*.

From the above it appears that inoculation material from tobacco and potato successfully infected *L. esculentum*, *Nicandra physalodes*, *S. aculeatissimum*, *S. atropurpureum*, *S. carolinense*, and *S. tuberosum*, while material from potato and Jimson weed infected *D. meteloides* and *D. stramonium*. *Nicotiana glutinosa* was infected when inoculated with material from three sources, tobacco, potato, and *N. glutinosa*.

Data were secured which appear to indicate that apparently healthy potatoes may carry a virus which is able to produce mosaic symptoms when transferred to other species.

Sudden development of a mold after the Tokyo earthquake and fire [trans. title], Y. TOKUGAWA and Y. EMOTO (*Japan. Jour. Bot., 2 (1924), No. 3, pp. 175–188, pl. 1*).—Shortly after the fire which followed the Tokyo earthquake, a fungus suddenly became conspicuous, largely on burned or partly burned trunks of trees or on structural wood. This proved to be *Monilia sitophila*. It is soon killed by saturated steam (100° C.), and in a damp state it is killed at 80° in about 10 minutes. In dry heat it is very resistant, withstanding temperature up to 130°. A postscript indicates the occurrence of this fungus in volcanic areas, after forest fires, etc., in other parts of the world.

The fungus contains coloring materials belonging to the carotin group.

Ringspot of crucifers caused by Mycosphaerella brassicicola (Fr.) Lindau, J. L. WEIMER (*Jour. Agr. Research [U. S.], 32 (1926), No. 2, pp. 97–132, pls. 6, figs. 2*).—The results are given of an investigation of a disease of cauliflower, broccoli, cabbage, Brussels sprouts, and other cruciferous crops grown in California. The disease is caused by *M. brassicicola*, and it is said to often occasion considerable loss in the San Francisco Bay region and in Oregon during wet seasons.

The symptoms of the disease, the life history of the fungus, etc., are described. Cold storage tests are said to indicate that the spots do not spread rapidly enough to make them a serious factor in the deterioration of cauliflower in transit.

Under the system of agriculture practiced in the San Francisco Bay region, seed bed sanitation and seed treatment are considered of little value for control, although it is thought that this would be helpful in Oregon where crop rotation is practiced. Treating the seed by immersing in water for 10 minutes at 55° C. (131° F.) or for 30 minutes at 50° is recommended where seed treatment can be adopted. Spraying and dusting are said to have been ineffective in controlling the disease, as well as having been injurious to the plants. The selection of resistant plants, together with the best horticultural practices, is thought to offer the best method for controlling the disease under California conditions.

Relation of temperature to spore germination and growth of Urocystis cepulae, J. C. WALKER and F. L. WELLMAN (*Jour. Agr. Research [U. S.], 32 (1926), No. 2, pp. 133–146, pl. 1, figs. 3*).—In a previous paper (E. S. R., 46,

p. 345) it was shown that infection by *U. cepulae* was possible at a soil temperature as low as 10 to 12° C. (50 to 53.6° F.), which is also about the temperature limit for the germination of onion seed. Infection was equally as abundant up to 25°, but at 29° or above onion seedlings were found free from disease.

The object of the present investigation was to determine whether the effect of temperature was exerted on the parasite, on the host, or on both. The minimum temperature for the germination and growth of the fungus was found to be very close to that of the onion plant. The optima for chlamydospore germination, hyphal-fragment germination, and vegetative growth of the thallus were found to lie between 13 and 22°. Above 25° there was a decided reduction in germination and growth, and such hyphae as did appear above 28° were not only very slow in development, but soon lost their viability on continued exposure to the higher temperatures. Protracted exposure to the near-minimum temperatures did not affect the slowly growing thallus. The marked inhibitive effects of temperatures above 25° upon the parasite, with the maximum lying slightly above 29°, are said to show the direct influence of temperature upon the parasite to be a primary factor in the limitation of infection.

The authors call attention to the fact that the smut organism is being continually introduced throughout the country on northern-grown onion sets, but that the disease has not as yet been recorded in the intensive southern onion-growing regions, while it has been established in most of the intensive northern sections, as well as in the northern, cooler areas of Europe.

Rye resistant to leaf rust, stem rust, and powdery mildew, E. B. Mains (*Jour. Agr. Research* [*U. S.*], *32* (*1926*), *No. 3, pp. 201–221, pls. 6*).—In a previous paper (E. S. R., 50, p. 129) an account was given of the reaction of varieties of rye to the rust *Puccinia dispersa*. Studies of some of the resistant plants were continued, and their behavior toward infection by stem rust (*P. graminis secalis*) and mildew (*Erysiphe graminis secalis*) was noted. The results of three years' investigations of the reaction of strains or lines of rye to the three diseases are given.

Plants highly resistant to leaf rust, stem rust, and mildew were obtained from Abruzzes rye. A study of two selections made from North Carolina grown rye of this variety is said to indicate that resistance to each disease is dominant, selfs of resistant plants yielding progeny among which were individuals showing various degrees of susceptibility. Resistance to each disease is said to be inherited independently of the others, various combinations of resistance and susceptibility to the three diseases being found in the progeny, indicating that resistance to each disease is due to a separate factor or factors.

Relative susceptibility of spring-wheat varieties to stem rust, J. A. Clark, J. H. Martin, and E. C. Stakman (*U. S. Dept. Agr., Dept. Circ. 365* (*1926*), *pp. 18, figs. 2*).—The results are given of cooperative experiments conducted by the Department and various experiment stations, in which tests were made of spring wheat in nurseries at 39 stations in the United States and Canada during one or more years from 1919 to 1924. Thirty-three varieties of wheat were tested and the relative percentage of rust infection determined.

The durum wheats were much more resistant as a class than the hard red spring wheats. The varieties Pentad, Monad, Acme, and Nodak were the most resistant. Of the hard red spring wheats, Kota and a few hybrid wheats were much more resistant than Marquis, and Marquis escaped rust slightly better than Power, Preston, and Haynes Bluestem. Except for the resistant varieties, the average rust infection on the common wheats increased

with the lateness of the average date of maturity of the varieties. Early varieties evaded rust better than Marquis. Two varieties of spring emmer that were tested were nearly immune to rust.

The authors consider that reduction of losses from stem rust of wheat by growing resistant varieties is a certain and feasible method.

Control of stinking smut of wheat with copper carbonate, B. L. RICHARDS and A. F. BRACKEN (*Utah Sta. Circ. 59 (1926), pp. 8, figs. 2*).—Directions are given for the treatment of wheat with copper carbonate for the control of this disease.

Results of tests with copper carbonate in Idaho, C. W. HUNGERFORD (*Abs. in Phytopathology, 13 (1923), No. 11, p. 512*).—The results of two years' testing of dust treatments for the control of stinking smut are said to have shown that none of the treatments have given as good control as the standard bluestone treatment under the conditions of the experiment. Germination, however, was better in every case where copper carbonate was used.

The copper carbonate bunt problem, F. D. HEALD (*Abs. in Phytopathology, 13 (1923), No. 11, p. 511*).—The author presents data which indicate that the treatment with copper carbonate dust is superior to the old wet methods of seed disinfection with copper sulfate or formaldehyde. In testing some commercial brands of copper carbonate, 2 oz. of one preparation containing from 17 to 21 per cent of metallic copper gave practically as good protection in spring plantings as pure copper carbonate, testing 50 per cent or more of metallic copper.

Disinfection of seed grain infected with Ustilago tritici [trans. title], E. MANCINI (*Italia Agr., 61 (1924), No. 8, pp. 389–398*).—The several seed treatments used included copper sulfate (1 per cent), formalin (0.25 per cent), copper carbonate (3 per cent), and hot water (54 to 55° C.). All increased germination, except possibly the hot water. Production was increased notably in case of the hot water, Braun (E. S. R., 43, p. 844), and copper carbonate treatments.

Root rot of the bean in California caused by Fusarium martii phaseoli Burk. and F. aduncisporum n. sp., J. L. WEIMER and L. L. HARTER (*Jour. Agr. Research [U. S.], 32 (1926), No. 4, pp. 311–319, pls. 3*).—A description is given of a root rot of beans, which is said to be very widespread in California, where every variety grown commercially is attacked. Isolations made from a large number of diseased roots showed that two species of Fusarium capable of causing the root rot of bean occur in them. One species was found to be identical with *F. martii phaseoli*, while the other was found to differ from any hitherto described species, and for it the name *F. aduncisporum* is proposed. A technical description of the new species is given. Both species are said to be equally parasitic.

Experiments on the control of black-leg disease of cabbage, E. G. REX (*Pennsylvania Sta. Bul. 199 (1925), pp. 23, figs. 11*).—A description is given of blackleg caused by *Phoma lingam*, one of the minor diseases of cabbage, which has in recent years been troublesome to Pennsylvania growers.

The disease is said to be seed borne, and the common formaldehyde and corrosive sublimate treatments have not been entirely satisfactory. The author's experiments with organic mercury seed disinfectants are said to have shown that these compounds have considerable value, and Uspulun and Semesan are considered the best remedial agents at present known for the control of cabbage blackleg. Evidence was secured to indicate the possibility of the fungus overwintering on host refuse and infecting the subsequent crop. The application of disinfectants to soil was found to be of doubtful value. The

transplanting of cabbage into a soil of high moisture content is said to have given favorable results. Puddling at the time of transplanting did not make the plants more susceptible to disease, but rather the reverse.

On the nature of resistance to cabbage yellows, E. C. TIMS (*Jour. Agr. Research* [*U. S.*], *32* (*1926*), *No. 2, pp. 183–199, figs. 2*).—In connection with an investigation of cabbage yellows studies were made of resistant and susceptible varieties to determine, if possible, the nature of resistance to the disease. No significant differences were found in root systems of resistant and susceptible plants, in the ability to form callous cells, or in expressed juice of the different plants, water extracts, H-ion concentration, etc. The resistant varieties were found to be invaded to a limited extent by the fungus when growing in infested soil, and this is held to suggest the existence of substances in the plant which are toxic to the hyphae of the invading fungus. It was found that cabbage plants contain sulfur in appreciable quantities in the form of glucosides as well as volatile sulfur, and it is suggested that there may be a sulfur-containing compound present in cabbage plants resistant to the yellows disease in sufficient amounts to account in part, at least, for the resistance factor.

A leaf, bract, and boll spot of Sea-Island cotton caused by Helminthosporium gossypii n. sp., C. M. TUCKER (*Jour. Agr. Research* [*U. S.*], *32* (*1926*), *No. 4, pp. 391–395, figs. 2*).—A description is given of a disease of Sea Island cotton causing spots on leaves, flower bracts, and bolls, which is present generally in the principal cotton-growing sections of Porto Rico. The author isolated a species of Helminthosporium from the diseased tissues, studied it in pure culture, and reproduced the disease through inoculation. The fungus is described as *H. gossypii* n. sp. It is said not to infect the seeds, and to be more severe under drought than under humid conditions.

Experiments on the control of cotton root rot in Arizona, C. J. KING and H. F. LOOMIS (*Jour. Agr. Research* [*U. S.*], *32* (*1926*), *No. 4, pp. 297–310, pls. 2, figs. 6*).—An account is given of experiments for the control of cotton root rot due to *Ozonium omnivorum*, which is said to be the most serious disease affecting cotton, alfalfa, fruit trees, and other economic plants in the valleys of southern Arizona. The authors report that it is impracticable in Arizona to apply the methods of control recommended for Texas. Experiments conducted in the Salt River Valley and at Sacaton, Ariz., have shown a reduction in the infected area and the number of cotton plants dying from the disease following applications of manure and other organic materials. By recording the progressive damage of the disease at different intervals it was found that the incidence of the disease was delayed in the manured areas, which allowed some of the plants time to produce nearly a full crop. Several of the plants in the manured plats, although healthy in appearance aboveground, were found to have infected and partially decayed roots. This is said to suggest that the fungus may be little affected by the application of organic materials, but that the plants may be better equipped to avoid or withstand the disease under the modified soil conditions.

Behavior of cotton root rot at Greenville, Tex., including an experiment with clean fallows, H. C. MCNAMARA (*Jour. Agr. Research* [*U. S.*], *32* (*1926*), *No. 1, pp. 17–24, figs. 4*).—As a result of several years' observation in fields where cotton was grown without irrigation, the author found the fungus *Ozonium omnivorum* spread in a radial direction as so indicated by the occurrence of dead plants.

Experiments in the eradication of the disease by maintaining a bare fallow for one and two years indicated that the fungus may be eliminated by absolutely clean fallow carried on for two years.

***On the flax anthracnose and its causal fungus, Colletotrichum lini* (Westerdijk) Tochinai**, M. Hiura (*Japan. Jour. Bot., 2 (1924), No. 2, pp. 113–132, pl. 1, figs. 3*).—*C. lini*, the cause of flax anthracnose, attacks leaves, stems, floral parts, capsules, and seeds in all developmental stages from the seedling to the mature plant, the two types here recognized, damping-off and canker, usually being found, respectively, in very susceptible and in very resistant varieties. The seeds are finally infected through the capsule after it has been pierced, the depth of the lesion corresponding to the severity of attack, that is, largely to the susceptibility. Endosperm or cotyledon infection prevents germination. The fungus can not attack capsule or seed after a certain degree of growth has been attained, and after completion of the pigment layer of the seed it can not attack the endosperm or cotyledon. In nature the fungus is disseminated chiefly by conidia, wind being the important factor.

The pasmo disease of flax, W. E. Brentzel (*Jour. Agr. Research* [*U. S.*], *32 (1926), No. 1, pp. 25–37, pls. 5, fig. 1*).—In a previous publication (E. S. R., 53, p. 851) the author reported the occurrence of a disease of flax caused by *Phlyctaena linicola*. The disease appears to have been introduced with imported flax seed, and it has been observed in North Dakota, South Dakota, Minnesota, and Michigan.

In the present paper an account is given of further observations and investigations on this disease. Under favorable environmental conditions it is said to cause considerable damage to both seed and fiber flaxes. The leaves and bolls of infected plants are blighted, and the invaded portions of the stems become more or less brown. A relatively high degree of soil moisture is said to favor the development of the disease, and lower areas of a field are usually more severely attacked than the somewhat higher portions. On young plants the fungus is said to be a weaker parasite than *Colletotrichum linicolum*, which causes flax anthracnose, but on plants which are blooming and developing seed *P. linicola* is said to be vigorous in its attack and spreads with marked rapidity. The ascigerous stage of the fungus has not been observed, but pycnospores winter over on straw and fragments of diseased plants, and spores are said to be disseminated in large numbers by means of infested seed.

For the control of the disease, treating the seed with formaldehyde, burning infested straw, and rotating crops are recommended. Resistance to the disease is indicated in some varieties and strains.

Fusarium rot of onions, L. W. Boyle (*Abs. in Phytopathology, 13 (1923), No. 11, p. 510*).—A brief account is given of rots of onions occurring in the field but more commonly in storage and transit. From diseased portions of the bulbs in an advanced stage of rot Fusarium spores were obtained, as well as bacteria. It has not been determined whether bacteria or fungi alone, or together, cause the rot.

A Botrytis disease of peanut [trans. title], N. Suematu (*Japan. Jour. Bot., 2 (1924), No. 1, pp. 35–38, pls. 2*).—A brief report is given of a study involving successful inoculation of *Arachis hypogaea* by sprinkling the plant with water containing spores of Botrytis.

Preliminary results of experiments with leaf roll and mosaic in Idaho, C. W. Hungerford (*Abs. in Phytopathology, 13 (1923), No. 11, pp. 511, 512*).—Experiments are reported in which Bliss Triumph potatoes from mosaic-free stock were grown under cloth cages, and various insects were introduced into these cages after having fed upon mosaic diseased plants. The green peach aphid (*Myzus persicae*), the pink and green rose aphid (*Macrosiphum*

solanifolii), the false chinch bug (*Nysius ericae*), the tarnished plant bug (*Lygus pratensis*), and several others were employed in this experiment. Positive results were secured with the pink and green rose aphid only. Characteristic mottling developed three weeks after the aphids were introduced into the cages. Tubers from these infected plants were later grown in the greenhouse, and in each case some of the tubers from each hill produced badly diseased plants.

Seed-potato treatment, B. L. RICHARDS (*Utah Sta. Circ. 60 (1926), pp. 16, figs. 8*).—After popular descriptions of Rhizoctonia, scab, blackleg, and dry-rot of potatoes, the author describes the corrosive sublimate and hot formaldehyde treatments which have been successfully employed for the control of these diseases.

The effect of pre-sprinkling with water on the hot formaldehyde and corrosive sublimate methods of potato seed treatment, J. M. RAEDER (*Abs. in Phytopathology, 13 (1923), No. 11, p. 512*).—Laboratory experiments are said to have shown that the efficiency of both the hot formaldehyde and the corrosive sublimate treatments for seed potatoes is increased by first sprinkling the potatoes with water and then covering them for 24 or 48 hours.

A new method of control of the sugar beet nematode [trans. title], B. RENSCH (*Mitt. Deut. Landw. Gesell., 39 (1924), No. 22, pp. 412–414; also in Deut. Zuckerindus., 49 (1924), No. 23, pp. 613, 614*).—Numerous methods previously proposed and tried of dealing with the sugar-beet nematode (*Heterodera schachtii*) have so far as fully tested generally proved impractical, but it is claimed that a new and radically different method has recently yielded results in the laboratory which give promise of success in field practice.

The statement by Baunacke (E. S. R., 49, p. 842) that these nematodes find the beet roots (through the attraction of some root secretion) by means of a highly developed chemotactile sense was first verified. Then it was proved experimentally that the stimulating effect of solutions containing juices from beet roots led to increased production of larvae from the cysts as compared with that given by the checks (in water). Search for substances capable of producing like stimulating effects led to the discovery of two such substances, which are designated as A and B. These, when contained (separately, and more when together) in a solution, stimulate the development of larvae from the cysts, even when there is no appropriate nutritive substance present to keep them alive.

This discovery is thought to render available a new means of nematode control. This preparation, when added to the soil even in very dilute solution after the removal of the beets, will, it is claimed, lead to the development of young nematodes at a time when they can find no appropriate sustenance. Moreover, the stimulating substance being present everywhere around them, they are not, presumably, attracted especially to the beet roots when these are present. It is stated that most weeds are poor hosts for these nematodes. It is admitted, however, that in Baunacke's work a few nematodes were found alive after six weeks.

Tests were initiated to ascertain the concentration requirements for successful use of this method in large-scale beet culture.

The like effect of chicory root in stimulating larvae to leave the cysts was also verified, and this work was continued. Chicory root stimulates larval development but is itself practically immune to nematode attack, containing apparently some substance obnoxious to these pests. This, then, acts in the same way as do the above-indicated preparations A and B, stimulating development of the nematodes from the cysts and starving them.

Control of the sugar beet nematode, B. RENSCH, trans. by W. K. WINTERHALTER (*Facts About Sugar, 19 (1924), No. 6, pp. 132, 133*).—A translation of the above.

Bacterial red stripe disease of Tip canes, H. A. LEE and W. C. JENNINGS (*Hawaii. Sugar Planters' Sta. Circ. 42 (1924), pp. 4, pls. 3*).—A cane disease which is said to be new and which is called red stripe is said to occur in the Kohala District on Yellow Tip, Striped Tip, and Red Tip canes. It is more conspicuous, and perhaps more serious, when attacking young canes from 6 to 36 in. high, those which are shaded by the older canes usually dying out entirely.

Isolations have yielded bacteria which in preliminary studies have reproduced the disease on inoculation, the checks remaining healthy. Apparently wind is a disseminator, rain or heavy dews probably also favoring the spread of the disease.

Red-stripe [cane] disease studies (*Hawaii. Sugar Planters' Sta. [Pub.], 1925, pp. 99, figs. 21*).—This is a collection of reports on studies chiefly by members of the staff of the department of pathology of the Hawaiian Sugar Planters' Experiment Station.

The cause of red-stripe disease of sugar cane, H. A. Lee and J. P. Martin (pp. 1–8).—Following up the statements contained in the paper by Lee and Jennings, above noted, the present account deals with isolation and inoculation studies claimed to prove the causal agency of the associated organisms, which have been, as yet, designated herein simply as A and B.

Description of the organism producing bacterial red-stripe disease of sugar cane, H. A. Purdy (pp. 9–17).—Morphological and cultural characters and the effect of physical conditions identified tentatively the causal organism with that described by Elliott (E. S. R., 50, p. 550) as *Bacterium panici*, causing a bacterial stripe of proso millet.

Diagnostic studies of the organism of red-stripe disease, H. A. Lee, J. P. Martin, and H. A. Purdy (pp. 18–24).—The pH range for growth lies between 5.4 and 7.3, the optimum between 6.6 and 7. A diagnostic test is possible by comparing growth on monosaccharides and disaccharides in peptone beef-extract agar containing cresol red and bromocresol purple. Apparently the sugar cane red stripe organism is a facultative anaerobe.

The effect of disinfectants on the organism causing red stripe of sugar cane, J. P. Martin (pp. 25–32).—The sugar cane red stripe organism is killed by phenol at 1 per cent in 5 minutes; by mercuric chloride at 0.005 per cent in 2.5 minutes; by lysol at 0.5 per cent in 2.5 minutes; by copper sulfate at 5 per cent in 2.5 minutes; by formalin at 5 per cent in 2.5 minutes, or at 2.5 per cent in 5 minutes; by commercial quicklime at 0.09 per cent in 2.5 minutes, at 0.08 or 0.07 per cent for 5 minutes; by lime sulfur at 1 per cent for 2.5 minutes; by Uspulun (Bayer) at 0.2 per cent for 2.5 minutes; and by Dupont fungicide No. 1 at 0.1 per cent for 2.5 minutes, or at 0.05 per cent for 10 minutes. Organic matter frequently lessens the toxicity of disinfectants, so that the results given show comparative rather than absolute values. Recommendations herein made allow, therefore, a factor for safety.

Transmission of red-stripe disease by cane cuttings, H. A. Lee (pp. 32–35).—An outbreak of sugar cane red stripe occurred in a planting of Kohala seedling varieties grown from cuttings originating in Kohala, and this having led to the belief that red stripe is transmitted, experimentation was carried out in the Kohala District, in which cuttings from healthy Yellow Tip were planted against Yellow Tip seedlings badly diseased with red stripe. Definite transmission of red stripe is said to have occurred, but only in one case from a total of 1,000 severely diseased cuttings. The transmission rate is, therefore, sup-

posed to be negligible. Transmission rate through seed cutting knives is probably small.

The susceptibility of roots, stalks, leaf sheath, and leaf blades to red-stripe disease, and the relationship of maturity of tissues to increasing resistance to red stripe, C. C. Barnum and J. P. Martin (pp. 35–48).—Roots, stalks, leaf sheaths, and leaf blades are susceptible, young leaf blades particularly so. Natural leaf infection in the fields occurs largely by way of the stomata.

The activities of the red-stripe organism in the soil, C. C. Barnum (pp. 49–64).—The red stripe organism is washed from diseased canes and may live in infected soil for at least 32 days, though there is definite reduction during this time in the number of bacteria present. Apparently it does not multiply in soil. Competition with other organisms is not a factor in sterilized tubed soils. Reduction of numbers in unsterilized soils is much more rapid than in sterilized soils, supposedly due at least in part to competition. It is supposed that the widespread infection of ratoon fields of Tip cane may be in part due to the washing down of bacteria by rains before the harvesting of the previous crop. General infections of entire fields of Tip cane must be due to wind-borne infection, though some may come from the soil.

A comparison of red-stripe disease with bacterial diseases of sugar cane and other grasses, H. A. Lee, H. A. Purdy, C. C. Barnum, and J. P. Martin (pp. 64–74).—A statistical and discussional review of bacterial diseases affecting grasses shows no similarity of any other organism yet isolated to the organism associated with the sugar cane red stripe disease of the Kohala District.

The causal organism is a bacterium hitherto undescribed, and is designated as the new species *Phytomonas rubrilineans*.

The histology of red-stripe disease, H. A. Lee and D. M. Weller (pp. 75–82).—An account is given of methods employed, entrance of the organism, tissues affected, and results observable.

Cane varieties resistant to bacterial red-stripe disease, H. A. Lee and C. C. Barnum (pp. 83–93).—Variety tests are quantitatively outlined, with results expressed in terms of the total lengths of red striping for purposes of varietal comparison.

Methods of combating red-stripe disease, H. A. Lee, C. C. Barnum, and W. C. Jennings (pp. 93–99).—Numerous plantation inspections have shown that red stripe disease is at present confined to the Kohala District and has not reached the other cane-growing regions of the islands with one exception, this being a small outbreak in Tip cane on Oahu in 1923, which was entirely eradicated. Though other precautionary measures are suggested, varietal resistance is emphasized.

Life history of Ustilago striaeformis (Westd.) Niessl which causes a leaf smut in timothy, W. H. Davis (*Jour. Agr. Research* [*U. S.*], *32* (*1926*), *No. 1, pp. 69–76*).—The life history of *U. striaeformis*, which causes leaf smut in timothy, is described. The germ tubes of the germinated smut spores from timothy were not found to penetrate the meristematic tissues in leaves, stems, and floral parts, and the author believes that infected seed is seldom, if ever, formed by the smut mycelium advancing from infected culms into the floral parts. His investigations indicate that seedling infection commonly occurs, and that in the soil the smut spores from timothy pass through an afterripening period of approximately 250 days, and when surrounded by proper environmental conditions germinate and infect timothy seedlings which have coleoptiles 1 cm. or less in length. The germ tubes from smut spores were found generally to penetrate coleoptiles on the third to the sixth day after inoculation, and hulling the seeds increased the susceptibility to infection.

Root and crown injury of apple trees, H. E. THOMAS (*New York Cornell Sta. Bul. 448 (1926), pp. 9, fig. 1*).—For several seasons the author studied the cause of root and crown injury to apple trees and the methods of reducing further injury and restoring injured trees. He found that root and crown injury is general in the orchards of New York, and while no pathogenic organisms were found constantly associated with the injury, *Hypholoma sublateritium* was found to cause decay in the bark and wood of injured roots on old trees. A limited distribution of this fungus in orchards is indicated.

Chandler has shown (E. S. R., 32, p. 42) that tissues of crowns and upper roots are slow in maturing, and the author is led to believe that the greater part of the injury reported in New York is caused by the action of low temperatures on immature crown and root tissues.

Proper orchard management is said to avoid injury, and injured trees may be saved by approach grafting with apple seedlings or with scion-rooted stock of hardy varieties.

Water-core of apples, C. BROOKS and D. F. FISHER (*Jour. Agr. Research [U. S.], 32 (1926), No. 3, pp. 223–260, pl. 1, figs. 9*).—Water core is said to occur in every important apple-growing section of the world. It has been attributed to various causes, among them an excessive water supply, excessive growth, etc.

Irrigation experiments by the authors showed that apples from lightly irrigated trees developed more water core than those from heavily irrigated trees, and apples from trees receiving heavy irrigation followed by a light one usually had more water core than those from trees receiving light irrigation followed by a heavy one. An excess of soil moisture late in the season is said to have shown no tendency to increase the amount of water core. Apples from trees which received nitrate or potash fertilizers usually had less water core than those from untreated trees. Large apples showed a greater susceptibility to water core than small ones, but increasing the size of the apples by irrigating or fertilizing did not increase the percentage of apples affected by water core.

Apples that were freely exposed to sunlight showed a strong tendency to water core, while those that were somewhat shaded were usually entirely free from the disease, except in very late pickings. Sunburned apples were extremely susceptible to water core. Water core was found to increase rapidly as the apples became overmature, and picking at the proper stage of maturity is considered the most practicable preventive for the disease. A close correlation was found between sap concentration and water core. Heavy irrigation tended to decrease both sap concentration and water core, while exposed and suuburned apples had a very high sap concentration and were very susceptible. The authors believe that water core is apparently the result of sap exudation under pressure, and that high sap concentration is a precursor of the disease.

Small-sized apples are said to have made better recovery in storage than larger ones, and the kind of wrapper employed had little or no effect upon the extent of recovery. In most cases the recovery was practically as complete in cold storage as in air-cooled storage. Arkansas and Winesap apples made a better recovery than Stayman Winesap, Rome Beauty, Delicious, or Jonathan. Water-core apples are said to have had a high degree of susceptibility to internal breakdown.

Peach yellows and little peach, W. A. MCCUBBIN (*Penn. Dept. Agr. Bul. 382 (1924), pp. 16, figs. 2*).—Yellows and little peach cause great losses in Pennsylvania, due to killing of the trees individually and to shortening of the

profitable bearing life of an orchard as a whole by so limiting returns as to necessitate complete replanting earlier than is normal.

These diseases, though undetermined as to causation, are transmissible. Such few seeds from diseased trees as will germinate may or may not transmit the diseases. Nursery stock is readily infected by budding. The diseases may also spread in the orchard by means not yet known. They do not appear to be transmitted by pollen or by soil to replants. No recovery occurs. Removal should be prompt. Inspection should take place preferably just before blooming, a week or so before the fruit ripens (about July 1), and late in summer.

Cranberry investigations in Pacific County, D. J. Crowley (*Washington Col. Sta. Bul. 196 (1925), pp. 72, 73, 74*).—The author reports that most cranberry growers spray with Bordeaux mixture to eliminate field and storage losses caused by fungi, and he calls attention to the necessity for care in order to see that the berries are dry when put into storage. Dusting as a substitute for spraying was tried in a few plats, but the results were not as satisfactory as those where spray methods were practiced.

Some preliminary investigations on the effect of frost on cranberries show that temperatures of 30° F. killed about 30 per cent of the blossoms while in the hook stage. During the season covered by the report a small plat was sprinkled with water just before freezing temperatures were reached, and very little frost injury was noted. It is claimed that where the blossoms are killed by frost or other cause a very dense growth of vine results.

Effects of weather on the world distribution and prevalence of citrus canker and citrus scab, G. L. Peltier and W. J. Frederich (*Jour. Agr. Research [U. S.], 32 (1926), No. 2, pp. 147–164, figs. 9*).—Based on investigations previously reported (E. S. R., 43, p. 848; 52, p. 54), the authors have correlated the effects of weather on the world distribution of citrus canker and citrus scab. It is claimed that citrus scab would be inhibited whenever a mean monthly temperature of 75° F. or above prevailed. Citrus canker could develop in all parts of the citrus regions of the world sometime during the growing season, but the period over which it would be active would depend on the number of months having a mean temperature of 68° or above. The disease would be the most severe at points having the greatest number of months with mean temperatures of 80° or above. The authors claim that temperature is in no case a limiting factor for the development of canker in any of the citrus regions of the world, while, on the other hand, it is one of the limiting factors in scab development.

Considering the moisture factor, citrus scab is not considered a serious disease in any citrus-growing region which does not have an annual rainfall of at least 50 in., rather evenly distributed throughout the year. A dry season is considered a more important factor in scab inhibition than a deficiency of precipitation during the spring months. A deficiency of precipitation during the growing season is considered the limiting factor in the development of citrus canker.

In conclusion the authors state that the amount, frequency, and seasonal distribution of precipitation is a limiting factor in the development of both diseases. Apparently the seasonal distribution is the most important factor to consider, as on the seasonal distribution of rainfall depends, to a large extent, the development or inhibition of these diseases in the citrus regions of the world.

Further studies on the overwintering of Pseudomonas citri, G. L. Peltier and W. J. Frederich (*Jour. Agr. Research [U. S.], 32 (1926), No. 4, pp. 335–345, pls. 3*).—Based on a study made in southern Alabama, the authors

claim that *P. citri* is overwintered in old spots on the leaves which remain on the tree, in spots on the twigs formed near the end of the growing season, and by means of an extended or arrested incubation period of the organism on leaves and twigs of the last growth of the season. This latter method of overwintering is said to occur only during seasons when frost is long delayed. The number of viable spots which winter over are said to be influenced by the severity of the winter, a severe winter causing almost complete shedding of infected leaves and the killing back of the angular wood. The viability of an individual canker spot is said to be more or less limited, and all spots on an infected tree do not serve to carry the organism through the winter.

ECONOMIC ZOOLOGY—ENTOMOLOGY

[Report of the Washington Station] division of entomology and zoology, A. L. MELANDER ET AL. (*Washington Col. Sta. Bul. 196 (1925), pp. 23, 24*).—In field tests with calcium cyanide, made by A. Spuler, for the destruction of the wireworm of irrigated land (*Pheletes occidentalis*) at Clarkson, on a tract of ground which had been in garden for 26 years and which had developed a wireworm population of approximately 400,000 to the acre, from 85 to 95 per cent of the worms at the baits were killed, reducing the infestation from 11 to 2 worms to the square foot of soil. In these tests, corn, beans, peas, and potatoes were planted in late February as trap crops, in rows 6 ft. apart, and 6 weeks later, when the wireworms had resumed activity and were feeding in the upper few inches of soil along the bait rows, calcium cyanide was placed a few inches from the plants.

The larvae and pupae of the strawberry root weevils *Brachyrhynchus ovatus*, *Otiorhynchus sulcatus*, and *O. rugifrons* were completely destroyed by a bait perfected by Melander, and to be described in a bulletin in preparation.

Oil spray investigations conducted jointly in the divisions of entomology and chemistry, by Melander, Spuler, and E. L. Green, led to the following conclusions: "Processes known as refining of lubricating oils do not add to the insecticidal value. There is no apparent difference in the effectiveness of paraffin and asphalt base oils. A medium to light oil gives the best results on leaf-roller eggs. Viscosity is of less importance than the distillation range in determining the value of a spray oil. A miscible type of oil gives better results than any of the mechanical emulsions. A caseinate emulsion gives better results than other mechanical emulsions. Cresoap can be made from either fish, animal, or vegetable oils. Glue varies in emulsifying power and does not always produce a good emulsion. The addition of extra soap to a miscible oil does not alter its insecticidal qualities. Spraying twice at half strength, either with or without caseinate spreader, does not give different results from spraying once at full strength. The addition of a caseinate spreader detracts from a miscible oil spray. An oil spray should be used at 7 or 8 per cent for leaf roller and not weaker than 4 per cent for San Jose scale."

It was found by Spuler that newly hatched grasshoppers are all destroyed through the distribution of 200 lbs. of granular calcium cyanide per acre over the ground where they congregate. The best results were obtained when the material was applied in the evening or during cool, cloudy days, at which times young grasshoppers have a tendency to congregate in small areas and become more or less inactive. Within five minutes after the calcium cyanide had been distributed, enough hydrocyanic acid gas was generated to overcome all the young grasshoppers, including those that were clinging to the grass as much as a foot above the surface of the ground. It is pointed out that the granular form of calcium cyanide is the best to use, since this form will

readily pass through a hand clover seeder and will immediately settle to the ground out of the way of grazing cattle. Actual counts on marked areas in the Grand Coulee near Coulee City showed the grasshopper population to number approximately 20,000,000 per acre, and in such situations 1 lb. of cyanide will destroy 100,000 grasshoppers.

The practicability of quantitative toxicological investigations on mandibulate insects, F. L. CAMPBELL (*Jour. Agr. Research* [*U. S.*], *32* (*1926*), *No. 4, pp. 359–366, figs. 2*).—This is a contribution from the New Jersey Experiment Stations, in which the methods developed for administering poison solutions to chewing insects are described, and the results obtained in experiments on the eastern tent caterpillar and the yellow-necked caterpillar are given.

The ability of certain mandibulate insects to imbibe completely drops of poison solutions has been utilized as a basis for the development of methods for the quantitative toxicological examination of soluble arsenical stomach-poison insecticides. By the use of these methods it has been found that trivalent arsenic is more toxic than pentavalent arsenic, that different species vary in susceptibility to arsenic poisoning, and that the minimum lethal dose of arsenic for the two species studied is about 0.02 mg of arsenic per gram of insect.

Factors influencing the selection of oil sprays, E. L. GREEN (*Washington Col. Sta. Bul. 196* (*1925*), *pp. 17, 18*).—Laboratory and field studies of oils have led to the conclusion that there is no important difference in the killing rate of those of similar boiling range from petroleum stock of asphalt and paraffin bases. The middle of the lubricating oil fraction seems the most effective. The viscosity of an oil seems to have only an incidental relation to its insecticidal effect, and therefore little benefit can be expected from the addition of kerosene to a lubricating oil before making it into an oil spray. The oils used this year were all samples that had been subjected to practically none of the processes known as refining.

[Cranberry] insect pests, D. J. CROWLEY (*Washington Col. Sta. Bul. 196* (*1925*), *pp. 71, 72*).—In work with the cranberry fireworm, satisfactory control was obtained by all growers who applied the regular nicotine sulfate spray. Three applications were found to give ample protection, and in bogs where the infestation was less severe two gave satisfactory control. On calm days, when the temperature was 70° F. or higher, fireworms were readily killed with nicotine sulfate at strengths of 1 to 600, 1 to 700, and 1 part to 800 parts of water. At temperatures under 60° very few fireworms were killed at those strengths. Investigations made during the year indicate that nicotine sulfate is less effective when combined with Bordeaux than when used alone. This was very noticeable when the nicotine was used at dilutions of less than 1 part to 400 parts of water. It is apparent that cool weather, or combining the nicotine with Bordeaux mixture, makes the nicotine less volatile and less effective for control of the fireworm.

Several oil sprays tested during the season proved unsatisfactory, the cranberry foliage appearing to be sensitive to oil sprays and severe burning resulting from the use of oil during the growing season.

The application of nicotine sulfate while the moths of the cranberry fruit worm were flying decreased the infestation considerably, and when an additional spray was applied one week later there was a further decrease in the number of berries attacked. The application of calcium cyanide to a small plat where the fruit worm moths were very abundant resulted in the disappearance of most of the moths, but the foliage was badly burned.

Encouraging results were obtained in the control of the root weevil (*Otiorhynchus sulcatus*) by the use of baits. Considerable damage was done in some of the younger bogs by cutworms. The infestation of oyster-shell scale was considerably reduced by an application of lime sulfur solution at a strength of 1 gal. to 20 gal. of water before growth had started in the spring.

Animal parasites and human disease, A. C. CHANDLER (*New York: John Wiley & Sons; London: Chapman & Hall, 1926, 3. ed., rev., pp. XIII+573, figs. [252]*).—A revised edition of this work (E. S. R., 48, p. 253).

A manual of the parasitic protozoa of man, C. F. CRAIG (*Philadelphia and London: J. B. Lippincott Co., 1926, pp. VIII+569, figs. 95*).—This is a work intended for the use of health officers, medical practitioners, teachers, laboratory and research workers, and medical students. In the discussion of malaria the author lists 32 species of anopheline mosquitoes that have been proven to transmit *Plasmodium vivax* G. & F.

The effectiveness of certain paraffin derivatives in attracting flies, W. C. COOK (*Jour. Agr. Research [U. S.], 32 (1926), No. 4, pp. 347–358, figs. 4*).—This is a contribution from the Montana Experiment Station. The experiments reported, in which over 50,000 flies were captured, have demonstrated the following points regarding the attraction of flies by organic chemicals of the paraffin series: (1) There is a definite optimum concentration for each compound studied. This concentration is related to the boiling point of the compound, and becomes smaller as the boiling point rises. (2) The relative attractiveness of paraffin alcohols and esters is related to the boiling points of the compounds. As the boiling point becomes higher the attractiveness decreases. This relation is somewhat obscured by two other relations: (*a*) The addition of a CH_2 group to the acid radical reduces the attractiveness much more than the addition of a similar group to the alcohol radical. (*b*) This is a corollary of *a*. Of a given set of isomeric compounds, that one is generally most attractive which has the lowest acid radical. (3) Iso or branched-chain compounds are relatively more attractive than their normal isomers. The difference in attractiveness increases as the boiling point increases.

A biological study of Cephus pygmaeus (Linnaeus), the wheat-stem sawfly, D. T. RIES (*Jour. Agr. Research [U. S.], 32 (1926), No. 3, pp. 277–295, figs. 10*).—This contribution from the New York Cornell Experiment Station deals with a wheat pest first recorded from Ithaca, N. Y., in 1887. From that time until about 1921 no reports were received of its injury, but in the latter year it became abundant, and its work became apparent in the wheat-growing areas of New York State. Since 1921 it has continued to increase in abundance and its ravages to increase in severity. The species is recorded from 13 countries of Europe and Asia, and in the United States has been collected from 20 counties of New York and 14 counties of Pennsylvania.

Food plants recorded up to the present are only wheat, barley, rye, and chess, although numerous other grains and grasses have been examined. "The injury produced is rather characteristic. The female deposits the egg within the stem early in June just before the head leaves the 'boot.' The larva after hatching works its way down the stem, eating the tissue that lines the interior walls, until a point about 0.5 or 1 in. above the ground is reached. It then forms a plug of excrement and frass in the cavity. Immediately below this plug it cuts a V-shaped groove around the interior of the culm, leaving only the epidermis uncut. Below this plug it places another plug of the same material, to the underside of which it attaches its hibernation cocoon.

"There is but one generation a year, the adults emerging the latter part of May or early in June, after which the eggs are deposited. These hatch in 7 to 10 days, and the larvae feed for about a month before they cut the stem off and go into hibernation for the winter, spending about 9 months in a semidormant stage. Pupation takes place in the spring about a week before the adults emerge. *C. pygmaeus* has but few natural enemies, there being only seven recorded in this country and two in Europe, all of which have been listed in this paper."

Platygaster hiemalis Forbes, a parasite of the Hessian fly, C. C. HILL (*Jour. Agr. Research* [*U. S.*], *32* (*1926*), *No. 3, pp. 261–275, figs. 6*).—In this contribution the author presents a general biological account of *P. hiemalis*, with records of its economic importance and seasonal history in the East. A historical review and bibliography of the species have been given in an account by the author previously noted (E. S. R., 47, p. 554).

This insect is one of the most widespread and effective parasites of the Hessian fly in the United States, killing annually in the eastern wheat-growing regions from 16 to 40 per cent of the fall generation of the fly, with an average yearly toll of 28 per cent. The eggs develop polyembryonically by twinning, monembryonically, and some become aborted. The resulting yield in adults has been found to be a 50 per cent increase over the number of eggs deposited, and an average of 6 adults emerge from each host. During the larval stage the parasite consumes the contents of the host, which, before succumbing to attack, however, usually succeeds in forming a darkened puparium.

"Before pupating the parasitic larvae form ovoid, yellowish-brown cocoons. These are found packed closely within the cuticula of the host larva inside the host puparium. The adult, which is about 1 mm. long and shiny black, is very active, flies readily, and is positively phototrophic. The female is able to reproduce parthenogenetically, and impregnated females usually deposit both fertilized and unfertilized eggs at a single oviposition. Approximately 66 per cent of the adults are females. The female deposits her eggs in the eggs of the host, and lays from 1 to 8 eggs at each oviposition. She seldom oviposits more than once in the same host. The ovaries of an average female contain 3,322 eggs. Throughout most of the East *P. hiemalis* passes the winter and early spring in the embryonic stage. During June and July it develops into free-living larvae, and by the end of August most of these have pupated and transformed into adults, ready to emerge from their cocoons during the oviposition period of the Hessian fly in the fall of the year."

ANIMAL PRODUCTION

A laboratory study to determine the best time to ensile corn, sunflowers, and Sudan grass, P. A. WRIGHT and R. H. SHAW (*Jour. Agr. Research* [*U. S.*], *32* (*1926*), *No. 4, pp. 321–333*).—This investigation, undertaken in the laboratories of the Bureau of Dairying, U. S. D. A., consisted of analyses of the Sudan grass plant at 8 successive stages of growth to compare with the series on corn and sunflowers (E. S. R., 45, p. 168); analyses of corn, sunflowers, and Sudan grass at 4 stages of growth before and after ensiling in wooden tubs; and a study of the products of fermentation in laboratory silos of corn cut at 9 different stages of growth and of sunflowers cut at 6 different stages.

Judging from the chemical composition, the best time to cut Sudan grass for silage appeared to be at the early blooming stage.

The studies of the fermentation changes in the corn and sunflower silages cut at successive stages of maturity showed that the percentage of reducing

sugars at first increased as growth progressed, but later decreased as the seeds matured, and that the maximum percentage of reducing sugars occurred at the time the kernels were forming in the corn, and at the early dough stage in the sunflowers. The silage after fermentation was completed showed a heavy loss in reducing sugars, which was so great that none was present in the silage of the immature plants. The one exception to this was in corn silage made from corn cut when the kernels were forming. This sample contained over 50 per cent of the reducing sugars present in the fresh green plant. The amount of nonreducing sugars in the green plants was much less than that of the reducing sugars, and only traces remained after fermentation was completed. Volatile acids were present in small amounts (less than 1 per cent) and did not appear to show any regular variation with the stage of maturity. Nonvolatile acids were present in considerably larger amounts than volatile acids in the corn plant, but the reverse usually occurred in sunflowers. The most desirable time for ensiling, judged on the basis of the sugar and acid contents, appeared to be at the time when the seeds were small and watery and when the water content of the whole plant was still somewhat high.

The study of the composition and keeping qualities of the corn, sunflower, and Sudan grass silages showed that the corn silages produced from corn cut when 20, 40, 60, and 80 per cent of the ears were in the dough stage (the remainder in the milk stage) differed only slightly in composition. The loss of nutrients was smallest and the quality of silage best when 80 per cent of the ears were in the dough stage, which led to the conclusion that this is the best stage for cutting for silage production.

The sunflower silage made from the most mature plants (rays dried and fallen) had the most desirable odor, but this silage was somewhat dry and woody. From the standpoint of chemical composition, sunflowers should be cut when in full flower and before the rays have begun to wilt or fall, but it appears probable that sunflowers cut at any of the four stages of growth, i. e., from full flower to the time when the rays have dried and fallen, would produce satisfactory silage, though no palatability tests were conducted.

Sudan grass cut at the early blooming or middle to late blooming stage made very good silage, but it was not as fragrant as corn silage. The silage made from more mature Sudan grass was too dry. There appeared to be little choice between the two early stages on the basis of chemical composition. Less dry matter and nitrogen-free extract were lost through fermentation from Sudan grass cut at the middle to late blooming stage, while less albuminoid protein and more crude fiber were lost during fermentation from silage cut in the early blooming stage.

As a general conclusion to the work the authors suggest that almost any forage crop which is palatable will make palatable silage, provided the moisture content is satisfactory. In case of too much moisture the soluble nutrients will be lost through drainage, and silage that is too dry will not pack well enough to prevent the growth of molds and undesirable fermentations.

Silage, F. T. Shutt and S. N. Hamilton (*Canada Dept. Agr. Bul. 50, n. ser. (1925), pp. 16*).—The composition and characteristics are given of samples of silage collected from various parts of Canada. The kinds included were sunflower, corn, oat, pea, vetch, sweet clover, and Sudan grass, and various mixtures of these crops.

The silica content of commercial feeds, with special reference to feed control, W. H. Strowd and W. B. Griem (*Wis. Dept. Agr. Bul. 64 (1924), pp. 9*).—The silica contents of certain feeds were determined, and unusually large amounts are suggested as indicating adulterations of various sorts.

Some facts concerning the feeding stuffs law of Kentucky and suggestions to the feeder, J. D. TURNER (*Kentucky Sta.* [*Pamphlet, 1924*], *pp. 4, figs. 3*).—A brief account of the essentials of the Kentucky feeding stuffs law.

List of brands of concentrated commercial feeding stuffs licensed for sale in New York State from January 1 to April 1, 1925 (*N. Y. State Dept. Farms and Markets, Agr. Bul. 177* (*1925*), *pp. 66*).—This is the usual list of brands of concentrated commercial feeding stuffs, together with their guaranteed analyses.

New factors in animal nutrition and their sources [trans. title], B. SJOLLEMA (*Ztschr. Tierzüchtung u. Züchtungsbiol., 5* (*1925*), *No. 1, pp. 1–74*).—The author has very completely summarized the more recent experimental work in Europe and the United States dealing with the fundamentals of mineral metabolism in animals and the relation of the antirachitic factor as supplied by various foods and sunlight to calcium assimilation. The work on the vitamin for reproduction is also reviewed.

The effect of mineral supplements on reproduction of the albino rat, W. D. SALMON (*Science, 62* (*1925*), *No. 1610, pp. 420, 421*).—The ration of corn meal, peanut meal, and acid phosphate found unsatisfactory for reproduction in the rat (E. S. R., 53, p. 167) was supplemented with dried meat, cod-liver oil, and wheat. The females produced normal numbers of young but furnished little milk, and many of the young were eaten, none reaching weaning age. Young were, however, reared successfully when 0.5 per cent of $NaHCO_3$ was added to the ration. The improvement through this addition is supposed to be due to the neutralization of the excess H_2SO_4 in the acid phosphate. From this it is concluded that a small amount of H_2SO_4 may limit the growth of the second generation with little or no effect on the growth of the first generation.

Normal variations of percentage weights of body organs of the albino rat with changing body weight, A. T. CAMERON (*Amer. Jour. Physiol., 74* (*1925*), *No. 1, pp. 151–157, fig. 1*).—The author reports the ratio of the weights of the liver, kidneys, heart, spleen, adrenals, testes, muscle, and thyroid to body weights in rats varying in live weight, and has compared the results with those of Donaldson (E. S. R., 50, p. 773). Certain differences which have been observed are pointed out.

Pseudo-cryptorchidism in an albino rat, C. P. STONE and W. R. MILES (*Amer. Jour. Physiol., 73* (*1925*), *No. 3, pp. 571–580, figs. 2*).—A case is described of a male rat born at Stanford University in which one testicle was normal while the other had assumed a fixed position between the skin and the abdominal muscles of the groin. After removing the normal testicle at approximately 11 months of age normal sexual activity was exhibited, but the individual proved to be infertile though complete fertility had been demonstrated prior to semicastration. Histological examination of the normal and abnormal testicles showed marked degeneration of the germinal epithelium in all tubules of the latter. The degeneration was complete in some tubules and no sperms were being formed in any. The seminal vesicles, coagulatory glands, and prostate were normal, while in a control animal completely castrated at the time the normal testicle was removed these secondary sexual organs were much reduced in size and had somewhat degenerated. Thus the abnormal testicle, though not producing sperms, must have produced sufficient of the sexual hormone to keep these glands functioning normally. Skin temperature measurements prior to and following castration indicated that the skin overlying the abnormal testicle was colder than the skin of the abdominal wall, but about 2° C. warmer than the skin over the normal testicle.

Recent developments in cattle breeding, G. F. FINLAY (*Edinburgh: Oliver & Boyd, 1924, pp. 62, pls. 4, figs. 2*).—Essentially a review of the contributions of genetics to the inheritance of color, sex, and other characters in cattle.

A study of the breeds of cattle in Lorraine, G. HAUSHALTER (*Étude sur les Races Bovines en Lorraine. Nancy: Soc. Impress. Typogr., 1924, pp. 170, pl. 1, figs. 12*).—An account of cattle production in Lorraine, including descriptions of the more common breeds.

Beef cattle: Their feeding and management in the Corn Belt States, R. R. SNAPP (*New York: John Wiley & Sons; London: Chapman & Hall, 1925, pp. VI+449, pl. 1, figs. 85*).—The four parts of this book deal with general aspects of the beef-cattle industry, the breeding herd, fattening cattle for market, and general problems in beef production. The principles of breeding, feeding, management, and marketing of beef cattle of various ages are given.

Feeding beef cattle, P. GERLAUGH (*Ohio Agr. Col. Ext. Bul., 21 (1925–26), No. 3, pp. 32, figs. 14*).—A discussion of the principles underlying the feeding of beef cattle, including comparisons of seasonal prices.

An economic study of the costs and methods of range cattle production on forty ranches in north central Texas, 1923, V. V. PARR and G. S. KLEMMEDSON (*Cattleman, 12 (1925), No. 4, pp. 9–25, figs. 4*).—A report of the cost of producing range cattle is given as determined from records kept on an average of 12,837 cows and 8,530 calves per year during 1920, 1921, and 1922 on 15 ranches and 59,643 cattle on 40 ranches in 1923. Various data on the breeding operations, management, and returns are also included.

Report on baby beef experiments, 1922–23 and 1923–24, G. S. ROBERTSON and F. DICKINSON (*North. Ireland Min. Agr. Tech. Bul. 1 (1924), pp. [1]+12*).—The results of experiments dealing with the production of baby beef during 1922–23 and 1923–24 are briefly reported.

During the first year four June calves on each of two farms were divided into two lots. Both lots in each case received the same treatment until the wintering period commenced, when two calves at each place were fed as stores on a ration of turnips and hay, while the others received in addition from 2 to 6 lbs. of crushed oats and linseed cake mixed. The stores were turned on grass pasture in May. The results at the time of disposing of the animals in June were decidedly in favor of the baby beeves, both as to average weights and in the estimated profit from the enterprise.

Three similar experiments were conducted in 1923–24 with like results. A third lot in two of these experiments receiving a limited ration of oats proved more profitable than those receiving hay and turnips only. It was also found that Milking Shorthorn calves could be used for baby beef production.

On the variability, correlation, and inheritance of hair fineness in sheep, W. SPÖTTEL (*Über Variabilität, Korrelative Beziehungen und Vererbung der Haarfeinheit bei Schafen. Leipzig: Borntraeger Bros., 1925, pp. IV+235, figs. 29*).—The relation between the fineness of wool and various other characters in the different breeds of sheep has been extensively studied. One portion of the work deals with a critical study of microscopic determinations of the fineness of wool.

It is pointed out that the samples to be used for such test should be taken from different parts of the body. The fat may be removed by ether or carbon bisulfide and short pieces of the fibers examined in glycerin. Measurements should be made on large numbers of fibers, especially when considerable variability exists. The curve for the variability of fiber thickness in a population was usually found to be asymmetrical. Another portion of the work shows the variation in the diameter of wool fibers selected from different

parts of the body of eight different breeds, producing fine, medium, and coarse wool. Still another part of the work deals with the relation of fineness of wool to various morphological and physiological factors. This study indicated that the different characters of the fibers were associated with changes in the epithelial cells of the animals. Trotting disease was found to have a distinct effect on the fibers in this way. Thyroid function also distinctly modified the fineness of the wool and the production of folds. The early maturity of mutton breeds was associated with an early decrease in the function of the intermediate portion of the hypophysis and of the pineal body.

The inheritance of fineness of wool was studied in the F_1, F_2, F_3, and backcrosses of Mouflon and Somali sheep with Merinos. An analysis of the results indicated that seven pairs of interacting factors were responsible for the fineness of the wool in the Mouflon cross, while five pairs were responsible for the production of the intermediate hair types. In the Somali cross seven pairs of factors appear to determine the numbers of intermediate fibers present, as well as the fineness of wool. The characters of the wool of each of the breeds crossed are given, and the effects of age on the parent breed and on each generation are pointed out. *Related literature is fully discussed in* detail.

Investigations of the lamb fleece of heather sheep and of Merinos [trans. title]. R. STURM (*Ztschr. Tierzüchtung u. Züchtungsbiol., 4 (1925), No. 1–2, pp. 145–156, figs. 4*).—The fibers of the wool of heather and Merino lambs have been measured as to length and diameter and classified according to types. The differences in the types on the lambs of the two breeds and at different ages are pointed out.

Fattening lambs, H. HACKEDORN, J. SOTOLA, and R. P. BEAN (*Washington Col. Sta. Bul. 196 (1925), p. 12*).—A continuation of the studies of the comparative feeding value of the various cuttings of alfalfa has mainly confirmed the average results of the first three years (E. S. R., 52, p. 672).

The relation of the fat-soluble factor to rickets and growth in pigs, III, S. S. ZILVA, J. GOLDING, J. C. DRUMMOND, and V. KORENCHEVSKY (*Biochem. Jour., 18 (1924), No. 5, pp. 872–880, pls. 2, fig. 1*).—In continuing this series of studies (E. S. R., 48, p. 73), the results of two experiments are reported in which rickets was produced on a ration of toppings, barley meal, dried separated buttermilk, animal charcoal, swedes, and chalk. The animals receiving this ration consumed an average of 1.085 oz. of CaO and 1.06 oz. of P_2O_5 daily. Sunlight was not allowed except to two control animals in the second experiment. Histological examinations of the bones, by Korenchevsky, confirmed the diagnosis of rickets. Normal health was restored to certain of the animals by the administration of cod-liver oil.

[Experiments with swine at the Iowa Station] (*Iowa Sta. Leaflets 1 (1925), pp. 7; 2, pp. 8; 3, pp. 4; 4, pp. 7; 5, pp. 7; 6, pp. 8; 7, pp. 7; 8, pp. 6; 9, pp. 5; 10, pp. 5; 11, pp. 8; 12, pp. 8; 13, pp. 6*).—Brief results of the following experiments, most of which have been noted from other sources, are given in these leaflets: The Costly Influence of an Inferior Sire, by C. C. Culbertson and J. M. Evvard; Simple Versus Complex Mineral Mixtures for Fall Pigs—1924—III, Simple vs. Complex Minerals on Bluegrass, Some Mineral Feeding Results with Pigs in Dry Lot Experimentation, Mineral Substances for Growing and Fattening Pigs in Dry Lot and on Pasture, Finishing Well-grown Shotes Efficiently in "Winter" Yards, White Gold in the Swine Kingdom, and Hogging-down Corn, Soybeans, and Hogging-up Artichokes, all by J. M. Evvard C. C. Culbertson, W. E. Hammond, and Q. W. Wallace; Salting Pork on the Hoof: It pays, by J. M. Evvard and C. C. Culbertson; Methods of Watering

Barley-Corn-Tankage-Salt-Fed Fall Pigs, by J. M. Evvard; Making Three Hundred Pound Fall Pigs by April, by J. M. Evvard and C. C. Culbertson; and Practical Feeding Experiments with Sodium Sulfate, Supplemental Feed Mixtures, and Pasture vs. Dry Lot and Adding Mineral Substances to a Swine Ration Rich in Tankage and Alfalfa Meal, both by J. M. Evvard, C. C. Culbertson, W. H. Hammond, and Q. W. Wallace.

[Swine feeding experiments at the Washington Station] (*Washington Col. Sta. Bul. 196 (1925), p. 13*).—The results of two experiments are briefly reported.

Fattening spring farrowed pigs, R. T. Smith.—The combined results of three experiments dealing with the feeding of field peas (E. S. R., 52, p. 872) are given. The pigs receiving limited grain rations with alfalfa or sweet clover pasture before the peas were available gained an average of 28.6 lbs. per head and consumed 93.5 lbs. of feed in 39.3 days, while full-fed pigs gained 46.1 lbs. and consumed 185.6 lbs. of feed per head in the same period. On the pea forage the limited-fed pigs made average daily gains of 1.13 lbs. in 50.9 days, while the full-fed pigs made average daily gains of 0.94 lb. Both lots were in marketable condition at approximately the same time.

Can seed wheat treated with copper carbonate be used as a hog feed? R. T. Smith and J. E. McCoy.—In preliminary tests 3 pigs were fed on tankage and wheat treated with copper carbonate, but 2 died and 1 was badly stunted. In another test, where the wheat was washed before feeding, results as satisfactory as with the check lot were obtained. Post-mortem examinations of 3 pigs fed definite amounts of copper carbonate showed that this drug tended to act as an intestinal irritant and lowered the resistance toward disease.

[Feeding experiments with swine at the Central Experimental Farm], G. B. Rothwell (*Canada Expt. Farms, Anim. Husb. Div. Rpt. 1924, pp. 36–52*).—The results of feeding and breeding experiments with swine are briefly reported.

[*Yorkshires v. Berkshires on clover, Japanese millet, and sweet clover pasture.*]—One lot of 15 Yorkshire pigs averaging 66 lbs. in live weight made an average daily gain of 0.69 lb. per head during 42 days on clover pasture as compared with 0.79 lb. by 9 Berkshire pigs averaging 52 lbs. The former lot consumed 2.53 lbs. of grain per 100 lbs. of gain as compared with 1.78 lbs. by the latter lot. When continued for 27 days on Japanese millet and white sweet clover pasture, 9 of the Yorkshire pigs made an average daily gain of 1.12 lbs. per head, while the daily gain of the Berkshires averaged 0.88 lb. The feed consumption per pound of gain was very similar in both lots, being 2.24 lbs. by the Yorkshires and 2.19 lbs. by the Berkshires. It is noted that the pigs readily consumed the clover in the first period and the Japanese millet and sweet clover during the second period. The Yorkshires made the greater gains, but they were less economical than those made by the Berkshire pigs. There was some tendency to sunburn amongst the Yorkshires.

Sudan grass v. marrow-stemmed kale as pasture crop for hogs.—One lot of 8 Berkshire pigs averaging 59 lbs. at the start of the experiment made an average daily gain on Sudan grass during a 58-day period of 1.05 lbs per head. A lot of 6 Yorkshires averaging 98 lbs. at the beginning of the experiment made an average daily gain of 1.20 lbs. per head on a similar area of marrow-stemmed kale during 49 days. Both lots received the same grain ration, including skim milk. It is concluded that the Sudan grass was slightly superior to the marrow-stemmed kale, since it was ready for pasture earlier and carried more pigs longer.

Hull-less v. ordinary oats—self-feeding v. trough-feeding—sows v. barrows.—Four lots of Berkshires containing from 6 to 8 pigs per lot, of which 2 consisted of sows, 1 of barrows, and 1 in which the sexes were mixed, were used for comparing self-feeding with trough-feeding and the nutritive value of ground hull-less oats and ground oats for fattening. The experiment lasted 103 days. The rations consisted of ground oats, shorts, and middlings (4:1:1) plus 3 per cent tankage, 3 per cent oil meal, and 2 per cent bone meal. One lot of sows had 2 parts of hull-less oats replaced by 2 parts of ground oats, and the lot consisting of the mixed sexes was self-fed. The average daily gains were 1.03 lbs. per head for the self-fed group, 0.81 for the sows on the regular ration, 0.81 for the barrows on the regular ration, and 0.96 lb. for the sows receiving the hull-less oats in the ration. The self-fed pigs, though making greater gains, consumed more feed per unit of gain than any of the other groups. The addition of hull-less oats to the ration not only produced greater gains but also resulted in more economical gains. A less desirable type of carcass from the bacon standpoint was produced by the self-fed pigs than by the hand-fed pigs.

Sweet clover meal and alfalfa meal for growing hogs.—Three lots of 5 to 6 Yorkshires each, averaging 104 to 132 lbs. in live weight, were used for comparing a regular grain ration consisting of oats, barley, shorts, and middlings (2:2:1:1) plus 3 per cent oil meal, with ones in which alfalfa meal or sweet clover meal were added. The experiment lasted 43 days, during which the pigs on the regular ration made an average daily gain of 1.54 lbs. per head as compared with 1.59 lbs. for those receiving alfalfa meal and 1.60 lbs. for those receiving sweet clover meal. A total of 100 lbs. of each of the supplemental feeds was given to each lot. It was concluded that though these supplemental feeds increased the rate of gain, they also increased the cost of the ration.

Milk substitute experiment.—Four lots of 8 Yorkshire pigs averaging from 35 to 70 lbs. in live weight at the beginning of the experiment were given a basal grain mixture of oats, barley, shorts, and middlings (2:1:1:1 during the first 60 days and 4:3:2:1 during the last 30 days of this experiment) plus 5 per cent oil meal and 3 per cent tankage. During the first 60 days one lot receiving skim milk as a supplement made an average daily gain of 1.05 lbs. per head and consumed 2.05 lbs. of grain per pound of gain. Another lot receiving milk powder fed at the rate of 1 lb. to 16 lbs. of water made an average daily gain of 0.9 lb. and consumed 2.27 lbs. of grain per pound of gain. A further lot on Pro-lac meal mixed at the rate of 1 lb. to 33 lbs. of water made an average daily gain of 0.84 lb. and consumed 2.11 lbs. of grain per pound of gain. The fourth lot, in which one-half of the skim milk fed to the first lot was replaced by water, made an average daily gain of 1.17 lbs. and consumed 2.94 lbs. of grain per pound of gain. At the conclusion of the first 60 days of the experiment one-half of the pigs from each lot were continued for another 30 days on the same feeds, while the grain ration of the remainder was mixed with water instead of the milk product used. The 4 lots receiving water mixed with their grain made average daily gains during this period of 1.04, 1.02, 1.0, and 1.16 lbs. per head, while the gains of the other lots were with skim milk 1.33, milk powder 1.33, Pro-lac 1.40, and milk and water 0.97 lbs. The author concludes that Pro-lac can be fed successfully as a substitute for skim milk. Milk powder, though producing satisfactory gains, was uneconomical.

Alfalfa meal and organic supplements for hogs.—Five lots of Yorkshire pigs averaging 44 to 66 lbs. in live weight were given a basal ration of oats, shorts, middlings, and barley (2:1:1:1) plus 3 per cent oil meal, while two other

lots received oats, alfalfa, shorts, middlings, and barley (2:1:1:1:1) plus 3 per cent oil meal. All lots received skim milk, and tankage and meat meal were supplied separately in hoppers in three of the different pens. The results indicated that all rations produced satisfactory gains, varying from 0.98 to 1.14 lbs. per head daily. The substitution of alfalfa meal for one-sixth of the grain ration did not prove economical, but it did improve the general appearance of the pigs. The slight increases in gains brought about by the tankage supplements did not compensate for the increased cost of the ration.

Feeding Lictonic in summer.—Two lots of 3 pigs each which had not been doing well were used for determining the effect of Lictonic on such animals. During the 90 days of the investigation the pigs receiving Lictonic made an average daily gain of 1.20 lbs. per head, while those receiving no Lictonic gained 1.25 lbs.

Feeding Lictonic in winter.—One lot of 7 pigs receiving Lictonic made an average daily gain of 1.04 lbs. per head as compared with 1.09 lbs. by another lot receiving none of the tonic.

Alfalfa meal v. alfalfa hay for brood sows.—A ration containing alfalfa meal with shorts, bran, oats, tankage, bone meal, and roots was compared with a similar ration in which alfalfa hay fed in racks replaced the alfalfa meal for wintering brood sows. The results showed that the sows fed alfalfa meal consumed less grain but, due to a greater loss of pigs, the feed cost per pig at 8 weeks of age was higher. Decidedly better farrowing results occurred on the alfalfa hay rations, the percentage of good pigs being 93.9 as compared with 83.03 for the alfalfa meal lot. The respective percentages of pigs raised were 78.7 and 64.4.

Pig raising in Queensland, E. Graham and H. C. Quodling (*Brisbane: Queensland Dept. Agr. and Stock, 1924, pp. 60, figs. 17*).—A popular discussion of the principles of swine production in Queensland, including descriptions of diseases.

Cheaper and more profitable pork thru swine sanitation, E. T. Robbins (*Illinois Sta. Circ. 306 (1926), pp. 16, figs. 12*).—A popular account of the effects of swine sanitation on 154 farms in Illinois. According to the method of sanitation the farrowing pens were cleaned and disinfected, and the sides of the sows were washed prior to farrowing. After farrowing the pigs were placed on clean pasture until 4 months of age. On 17 farms a part of the litters were raised in the old way, while others were raised by the new method. When sanitation was practiced the litter size was larger and growth was more rapid.

Stallion enrollment.—XIV, Report of stallion enrollment work for the year 1925 with lists of stallions and jacks enrolled (*Indiana Sta. Circ. 129 (1925), pp. 47, fig. 1*).—This is the usual report of the stallion enrollment in Indiana for the year 1925, including a list of stallions and jacks enrolled for public service (E. S. R., 52, p. 874).

Poultry culture: The breeds of fowls—hens, guinea fowls, turkeys, ducks, geese, and pigeons, C. Voitellier (*Aviculture: Les Races de Volailles—Poules, Pintades, Dindons, Canards, Oies, Pigeons. Paris: J.-B. Baillière & Sons, 1925, pp. 288, figs. 176*).—Descriptions of the different breeds and types of the various classes of domestic poultry are given.

Practical poultry management, J. E. Rice and H. E. Botsford (*New York: John Wiley & Sons; London: Chapman & Hall, 1925, pp. XVII+506, pl. 1, figs. 307*).—This is a comprehensive textbook on poultry production, special portions of the work dealing with culling and selection, housing and the construction of poultry houses, feeding of different classes of poultry, the anatomy and physiology of the domestic fowl, artificial light, record keeping, diseases

and sanitation, marketing of poultry products, breeding and incubation, caponizing, management, and descriptions of the various breeds and varieties of fowls.

[**Poultry experiments at the Washington Station**], J. S. CARVER (*Washington Col. Sta. Bul. 196 (1925), pp. 36, 37*).—Brief results of experiments with poultry are given. In pedigreed matings of Single Comb White Leghorns and Rhode Island Reds, begun in 1923, 3,000 chickens were produced in 1925 from hens laying over 200 eggs mated to cockerels from dams laying 250 eggs or over. The pullets of the 1923 breeders averaged 212 eggs for the Leghorns and 208.6 eggs for the Rhode Island Reds.

[**Poultry husbandry experiments in the Philippines**], A. HERNANDEZ (*Philippine Bur. Agr. Ann. Rpt., 23 (1923), pp. 40–47*).—The results of investigations conducted are briefly reported.

Comparison of the egg production of Indian Runner ducks and native ducks.—The egg production of lots of 25 Indian Runner ducks 1.5 years of age and 25 native ducks of similar age was compared, both receiving approximately the same treatment and management and the same ration of palay and susô.

The results showed that the Indian Runner ducks laid an average of 85.1 eggs per bird from May to December as compared with 117.1 eggs by the native ducks during the same time. It is estimated that the feed cost for the Indian Runner ducks was also greater than that for the native ducks. The average weights of a few eggs were recorded which indicated 78.85 gm. for the Indian Runner duck eggs and 67.05 gm. for the native duck eggs. Incubation studies with the eggs resulted in 65.76 per cent of the native duck eggs hatching as compared with 17.24 per cent for Indian Runner duck eggs incubated in June. Another incubation in November resulted in 48.59 per cent of the native duck eggs hatching as compared with 6.09 per cent of the Indian Runner duck eggs.

Comparative test of the feeding value of sorghum grain and palay and corn combined as feeds for laying hens.—A progress report of the egg production of 2 lots of 10 each of Buff Orpington-Cantonese hens during the period May 15 to December 31 is given. One lot of birds received whole sorghum grain, while the other lot received whole palay and corn until September 15. Beginning with October 1 the rations of the two lots were reversed. The average gains per month of the birds receiving sorghum alone were 0.017 kg. as compared with 0.039 kg. by those receiving palay and corn. The average egg production by the birds receiving sorghum was 7.9 per month as compared with 5.4 eggs per month by the lot receiving corn and palay.

Feeding chicks with Cotabato adlay.—In a 10-weeks' experiment 3 lots of 20 chicks each were used for comparing 4 parts of adlay, 4 parts of binlid, and 4 parts of corn meal, respectively, as additions to a ration of 2 parts copra meal, 6 parts rice bran, and 1 part mongo meal. A fourth lot received a regular mixed feed consisting of 3 parts rice bran, 2 parts mongo meal, 1 part corn meal, 2 parts copra meal, and 1 part binlid. The results showed that the check pen made average weekly gains per chick of 17.71 gm. as compared with 19.06 gm. for the lot receiving adlay, 13.91 gm. for that receiving binlid, and 18.44 gm. for that receiving corn. The respective mortality percentages were 75, 50, 73.68, and 78.95. The results indicated that the Cotabato adlay is a good chick feed, and its cost of production is claimed to be lower than that of palay or corn.

Cross breeding experiments with chickens.—The preliminary results of experiments in crossing a number of different breeds indicated that the White Leghorn × Buff Orpington-Cantonese is likely to be the most successful.

The selection of breeding stock in relation to the inheritance of form and function in the domestic fowl, M. A. JULL (*Poultry Sci., 5 (1925), No. 1, pp. 1–19, fig. 1*).—The relation between various body characters and egg production is discussed. Various obstacles are pointed out which render the selection of laying strains of poultry difficult. Selection with reference to the quality of the sisters and brothers of the breeders is the only way by which definite and rapid progress can be expected.

The inheritance of fertility and hatchability in poultry, F. A. HAYS and R. SANBORN (*Massachusetts Sta. Tech. Bul. 6, pop. ed. (1924), pp. 4*).—A popular edition of the bulletin previously noted (E. S. R., 51, p. 429).

The changes in the lime content of the hen's egg during development, R. H. A. PLIMMER and J. LOWNDES (*Biochem. Jour., 18 (1924), No. 5, pp. 1163–1169*).—Analyses of the calcium content of three series of eggs during successive stages of incubation at St. Thomas's Hospital Medical School, London, indicated that prior to incubation the average lime content of the egg is 0.04 gm., but that the amount increases to 0.06 gm. on the eleventh day and 0.08 gm. on the fifteenth day. After this period there was a gradual increase of approximately 0.02 gm. daily as incubation progressed. The chick about to hatch contained 0.20 gm. and the hatched chick 0.25 gm. of lime. Pigeon eggs showed a similar increase in lime during the incubation period. The variability in the lime content of the eggshells made it impossible to check the loss of lime, but the shell membranes showed a distinct increase in lime during incubation as compared with the unincubated egg. Analyses of shell-less eggs indicated that the membrane contained sufficient lime for the needs of the embryo, but evaporation in such eggs prevented their hatching.

The effect of thyroid feeding on the moulting process and feather structure of the domestic fowl, H. B. TORREY and B. HORNING (*Biol. Bul. Mar. Biol. Lab., Woods Hole, 49 (1925), No. 4, pp. 275–287, figs. 3*).—In experiments at the University of Oregon, the feeding of thyroid to young chicks was found to modify the first set of rectrices, resulting in a shortening of the vane with a proportionate lengthening of the naked region of the shaft and producing a characteristically quilled feather. The molt was also accelerated, due to the forcing up of the second rectrices. There was a tendency for the base of the first feathers to be continuous with the tip of the second rectrices. The effect was similar on the normal birds of both sexes and on birds from which the gonads had been removed. The physiological processes, relating to feather development, affected by the thyroid feeding are discussed.

The antineuritic properties of corn germs, C. W. CARRICK and R. H. CARR (*Poultry Sci., 5 (1925), No. 1, pp. 26–34, figs. 5*).—In continuing the study of the nutritive properties of corn germs at the Indiana Experiment Station (E. S. R., 54, p. 271), lots of 1 or 2 mature cockerels were fed ad libitum on the following rations: Whole white corn, degerminated yellow corn, degerminated white corn, degerminated white corn and meat meal (9:1), degerminated white corn and white corn germs (8:2), degerminated white corn and white corn germ residue after extracting with ether (7:3), degerminated white corn and white corn germ residue after extracting with alcohol (7:3), degerminated white corn and corn germ mash (9.8:0.2), ether extract of 2.5 lbs. of corn germs evaporated on 10 lbs. of degerminated white corn, alcoholic extract of 2.5 lbs. of corn germs evaporated on 10 lbs of degerminated white corn, and degerminated white corn plus from 2.5 to 5 cc. of cod-liver oil daily per bird. Grit and water were also available.

The results indicated that corn germ contains a substance which tends to prevent polyneuritis in fowls. The presence of this substance was also demonstrated in the yeast and alcoholic extracts of the corn germ. The 2 cockerels

receiving whole white corn only were able to survive for 210 and 224 days, respectively, notwithstanding its known deficiencies in proteins, minerals, and fat-soluble vitamins. Birds receiving the degerminated white corn lost their appetites but again consumed this feed after a few days' administration of yeast.

The protein requirements of growing chicks, F. E. Mussehl and D. E. Gish (*Poultry Sci., 5 (1925), No. 1, pp. 20–23, fig. 1*).—In an experiment to determine the optimum amount of animal protein for baby chicks, 7 lots of 35 1-week-old chicks were selected. One lot received the simple ration recommended for chicks by the Wisconsin Station (E. S. R., 52, p. 573). The other 6 lots received a basal ration consisting of a scratch feed composed of equal parts of cracked yellow corn and cracked wheat and a mash composed of 24 per cent each of yellow corn meal, wheat bran, wheat shorts, and pulverized barley, plus 4 per cent of a salt mixture consisting of raw bone meal, ground limestone, and common salt (3:1:1). For certain of the lots the mash was supplemented with 0, 5, 10, 15, 20, and 25 per cent of meat and bone meal, thus making the following percentages of animal protein in the total rations: 0, 1.84, 3.92, 6.01, 8.29, and 10.4, respectively. The Wisconsin ration contained 7.54 per cent of animal protein, supplied by milk. Access to sunlight was allowed. There were 2 birds lost by death on the Wisconsin ration, as compared with 4, 4, 6, 1, 0, and 0 in the lots receiving the meat and bone meal supplements as 0 to 25 per cent, respectively, of the mash. The authors conclude that chicks make good use of animal protein concentrates, when added to a basic ration of corn, wheat, and barley plus minerals to the extent of 19.5 per cent of the total ration, while the growth rate is progressively improved as the amount of animal protein is increased.

Feeding for commercial egg production, O. C. Krum (*Colo. Agr. Col. Ext. [Bul.] 234A (1925), pp. 19, figs. 13*).—Popular directions for feeding laying hens.

Ducks—show and utility, C. A. House (*London: Poultry Press, [1925], pp. 113, pls. 12, figs. 7*).—A popular treatise dealing mainly with the different breeds of ducks.

Reproduction in the rabbit, J. Hammond (*Edinburgh: Oliver & Boyd, 1925, pp. XXV+210, pls. 20, figs. 3*).—The fundamental processes underlying reproduction in the rabbit are described, based largely on the investigations of the author, with a foreword and a chapter on the formation of the corpus luteum by F. H. A. Marshall. The titles of the other chapters include introduction reproduction in the male, the female reproduction phases, ovulation and the Graafian follicle, the preliminaries to fertilization, sterility, the effects of lactation, and the duration of pregnancy.

Rabbits for food (*Lamoni, Iowa: Blair Ptg. Co., 1925, pp. 30, figs. 17*).—A popular account of rabbit production, with special reference to their uses for meat and skins.

Raccoon raising, J. L. Edwards (*Utica, N. Y.: Fur Farms Pub. Co., 1925, pp. 38, figs. 14*).—Popular directions are given.

DAIRY FARMING—DAIRYING

[Experiments with dairy cattle], E. V. Ellington and J. C. Knott (*Washington Col. Sta. Bul. 196 (1925), pp. 20, 21*).—Results of two experiments are noted.

Pineapple pulp as a feed for dairy cattle.—Pineapple pulp was compared with sunflower silage in a feeding test with four dairy cows. The ration consisted of 1 lb. of chopped alfalfa and 3 lbs. of sunflower silage or soaked pineapple

pulp per 100 lbs. live weight. Grain was fed at the rate of 1 lb. daily for each pound of butterfat produced per week. Both types of succulent feeds were well eaten, but the pineapple pulp appeared to be consumed with greater relish. There was no appreciable difference in milk production.

The effect of exercise and feed on the vitality of sperm cells and breeding ability of bulls.—A continuation of this project has confirmed the conclusions of earlier experiments (E. S. R., 52, p. 870). The sperms in the semen of one bull which had not been in service for several months were inactive at the first service, but in two services on the following day 23 per cent were active after 30 minutes and in two on the next following day 95 per cent were active after 30 minutes and 90 per cent after 3 hours.

Succulent feeds for dairy cows in summer, H. H. Kildee, E. Weaver, J. M. Shaw, and F. Ely (*Iowa Sta. Bul. 231 (1925), pp. 73–96, figs. 2*).—A general discussion of the use of soiling crops based on eight years' experiments at the station, some of which have been previously noted (E. S. R., 41, p. 181).

Rate of milk secretion as affected by advance in lactation and gestation, W. L. Gaines and F. A. Davidson (*Illinois Sta. Bul. 272 (1926), pp. 3–36, figs. 24*).—Based on a study of 4,522 Guernsey Advanced Registry records at the station, the authors show that the milk yield, butterfat yield, and milk yield corrected to a 4 per cent butterfat content decline at a regular rate during the laetation period in farrow cows, which could be expressed by the formula

$$y_m = Ae^{-kt}$$

in which y_m is the milk yield for a month, t time from calving, k is a constant representing the rate of decrease in yield per month, and $A = a\frac{e^{.5k} - e^{-.5k}}{k}$, in which a is a constant representing the initial yield in pounds per month. The application of this formula to cows in early pregnancy indicated that 5 months' gestation did not appreciably affect the rate of milk secretion, but in cases of cows in advanced stages of pregnancy the milk yield was inhibited, so that the formula suggested had to be corrected as follows to fit the observations:

$$y_m = Ae^{-kt} - Be^{K(t-c)}$$

in which K is a constant representing the rate of change per month in the rate of inhibition of milk secretion due to pregnancy, c is the number of months from calving to conception, $t-c$ is the time in months from conception, and $B = b\frac{e^{.5K} - e^{-.5K}}{K}$, in which b is a constant representing the initial rate of inhibition of milk secretion. It is stated that the constant K appears to be the same for various groups, but B is roughly proportional to A.

A hormone hypothesis is suggested as inhibiting the rate of milk secretion in pregnancy and, also, as increasing secretion after parturition.

The effect of advance in lactation and gestation on mammary activity, W. L. Gaines and F. A. Davidson (*Jour. Gen. Physiol., 9 (1926), No. 3, pp. 325–332, figs. 4*).—An abridgment of the above.

The chlorine content of goat's milk at the beginning and end of the lactation period [trans. title], A. Stockreiter (*Milchw. Forsch., 2 (1925), No. 6, pp. 450–456*).—In studies at the Veterinary High School, Vienna, the chlorine content of the milk of five goats was determined at intervals during approximately four months of the lactation period and for shorter periods with two other goats. The analyses showed that the chlorine content increased similarly in all the animals as the lactation period advanced, though each

showed individual differences. The colostrum contained an average of approximately 100 mg. of chlorine per 100 cc. Between 20 and 30 days after parturition the amounts varied from 120 to 180 mg., and approached 200 mg. per 100 cc. of milk toward the end of lactation. The morning milk contained less chlorine than the noon milkings, and the night milk contained more than the noon milkings. The two halves of the udder of individuals showed average differences of 6 mg. of chlorine per 100 cc. of milk.

The division of fat in milk [trans. title], O. RAHN (*Milchw. Forsch., 2 (1925), No. 6, pp. 383–404, figs. 3*).—In studies at the Institute for Dairy Investigations at Kiel, the diameter of the fat globules in raw milk, cream, skim milk, buttermilk, and homogenized milk has been measured in microns, and the percentage distribution of each size has been determined, from which the percentage of the weight of the globules of each size in the total fat has been calculated. The data for each product are tabulated in detail. Further studies of the effect of the various processes which the milk undergoes in the dairy were similarly conducted.

The results indicated that the greater part of the fat globules over 2μ in diameter in the milk go into the cream when separated by the centrifugal method. Butterfat was found to have larger sized fat globules than skim milk. Homogenization reduced the size of the globules provided the temperature was above 60° C. and the pressure was sufficiently high. Plant operations which agitated the milk tended to split the fat globules, but the amount of splitting was not usually great. When the temperature was not over 63°, in certain cases of agitation there was some tendency to clump the fat globules.

Is the reductase test a measure for the determination of quality in milk? [trans. title] HANKE (*Milchw. Forsch., 2 (1925), No. 6, pp. 343–372*).—The ability of pure and mixed cultures of various bacteria to decolorize methylene blue as used in the reductase test has been investigated at the Institute for Dairy Investigations at Kiel.

The results of these investigations have indicated that most bacteria have the ability to reduce the color, but the speed with which reduction is brought about depends on the nutrient media, the temperature, and the numbers of organisms present. Lactic acid bacteria are very important in the reductase test since they are present in large amounts in milk.

The author concludes from the work that this test is not entirely satisfactory for determining the quality of milk, because it does not differentiate between the types of bacteria present and various factors, such as antiseptics, may materially affect the results. The reductase test may be used as a supplementary test, indicating mainly the care with which the milk has been handled.

The meaning of the temperature coefficient for the study of milk pasteurization [trans. title], O. RAHN (*Milchw. Forsch., 2 (1925), No. 6, pp. 373–382*).—The author has reviewed the work of other investigators, which has shown the effect of different temperatures for varying periods on the precipitation of albumin, the destruction of vitamin C and enzymes, and the lowering of the bacterial count in milk through pasteurization. It is concluded that the present knowledge of the nutritive effects of these changes is insufficient to make definite recommendations for proper pasteurization temperatures and for the duration of the pasteurizing period.

Acidity-reduction in cream for buttermaking, G. M. VALENTINE (*New Zeal. Jour. Agr., 31 (1925), No. 1, pp. 1–8*).—The reduction of acidity in cream for butter making is discussed, and a table is presented including directions for the neutralization of cream with bicarbonate of soda.

Investigations of the enzyme content of buttermilk, F. KLAGER (*Untersuchungen über den Enzymgehalt der Buttermilch. Inaug. Diss., Univ. Leipzig;*

Wangen, Allgäu: Milchw. Lehr- u. Forschungsanst., 1924, pp. 40).—The author has made determinations of the specific gravity, fat content, acidity, and reductase, catalase, and diastase contents of cream before and after ripening and of the buttermilk made from the cream after churning.

In the samples tested the specific gravity of the buttermilk varied from 1.0275 to 1.0302 and the fat content from 0.15 to 2.15 per cent. The acidity and enzyme contents of the buttermilk were found to be associated with the handling and treatment of the cream. The acidity of the buttermilk was higher than the cream from which it was made, indicating that the acid goes largely into the buttermilk and that acid production goes on more rapidly than in the cream. The amount of reductase in the buttermilk was usually somewhat greater than in the ripening cream. There was less catalase and diastase in the buttermilk than in the unripened cream, but there was more catalase in the buttermilk than in the ripened cream, while the amount of diastase in the buttermilk was less than that in the ripened cream.

The book of cheese, C. THOM and W. W. FISK (*New York: Macmillan Co., 1925, rev. ed., pp. XVI+415, figs. 74*).—A revised edition of the book previously noted (E. S. R., 40, p. 283). A chapter on the improvements in the cheese industry during the past seven years is included.

Contribution to the knowledge of the action of rennet [trans. title], W. GRIMMER and M. KRÜGER (*Milchw. Forsch., 2 (1925), No. 6, pp. 457–481, figs. 15*).—In studies at the Institute for Dairying of the University of Königsberg, the relation of the amount of rennet and acidity and temperature of the milk to the time required and completeness of coagulation was investigated. The results did not confirm the idea that the product of the amount of rennet and the time required for curding was a constant, but they showed that this product increased as the amount of rennet added increased. The results also showed that this product could be expressed by the logarithmic curve

$$\log (A - y_1) - \log (A - y_2) = c (x_2 - x_1)$$

where A = the maximum product of the amount of rennet and the time required for curding, x_1 and x_2 = the amount of rennet at different times, y_1 and y_2 = the respective time required for coagulation, and c = a factor determined for individual cases based on the amount of rennet used. The acidity and temperature of the milk also influenced the curding. When the acidity was high the product of the amount of ferment and time was lower. Temperature likewise affected curding. It was found that logarithmic curves could be calculated to correct for acidity and temperature.

Which is it, viscosity or plasticity? B. I. MASUROVSKY (*Ice Cream Trade Jour., 21 (1925), No. 5, pp. 61, 62, fig. 1*).—In studies of ice cream mixes with the MacMichael viscosimeter at the Nebraska Experiment Station, the results indicate that the ice cream mix exhibits internal friction and thus it is plasticity rather than viscosity that is being tested. Internal friction was not apparent in milk or cream.

The effect on the viscosity, bacterial flora, and quality of the resulting ice cream when the ice cream mixture is re-emulsified, re-viscolized, or re-homogenized, W. H. E. REID and S. F. SCISM (*Missouri Sta. Research Bul. 82 (1925), pp. 3–22, figs. 6*).—This gives a complete account of the investigations which were previously noted from the annual report (E. S. R., 54, p. 771).

VETERINARY MEDICINE

The comparative anatomy of the domesticated animals, Part I, J. M'FADYEAN (*London: H. K. Lewis & Co., 1924, 3. ed., pt. 1, pp. VI+210, figs. 151*).—The first section of this work deals with osteology (pp. 11–167) and the second section with arthrology (pp. 171–210).

[Report of the Washington Station] division of veterinary science, J. W. KALKUS (*Washington Col. Sta. Bul. 196 (1925), pp. 42–45*).—This report deals particularly with work with abortion in cattle, and refers briefly to experiments with red water in cattle, from which nothing definite has as yet developed.

Work with the Holstein herd at the Western Washington Station demonstrated that where *Bacillus abortus* infection exists in a herd the disease can be controlled by proper herd management. This consists of dividing the herd into two groups, based upon the agglutination reaction, and keeping the two groups separated when they are at liberty, which necessitates having separate pastures in the summer and two open sheds in the winter. It is pointed out, however, that methods of herd management similar to that practiced in the station herd have been tried and supervised in so far as was possible in a number of privately owned herds on average dairy farms without the same degree of success. This is, in the author's opinion, due to a number of factors, including the difficulty for the average dairyman to understand thoroughly all of the technical points in connection with the cause and the means of transmission of contagious abortion, and, therefore, to carry out effectively the necessary sanitary measures. The hindrances mentioned make it appear that it is out of the question, at least for the immediate present, to advocate this system on the average dairy farm.

The application of the agglutination test resulted in the discovery of a number of abortion-free herds and others in which only a small percentage of the herd was infected and in which the disposal of the reacting animals and the making of several retests resulted in its elimination. It is pointed out that not infrequently recently infected pregnant cows that fail to show a reaction may subsequently abort and then, as a rule, develop the reaction. The experiments show that the presence of *B. abortus* infection in the uterus of a reacting cow when she carries a full-time calf is the exception rather than the rule. The bacteriological examinations thus far carried out, according to the author's records, show that only 1 cow out of 15 carries infection.

In vaccination work both bacterins and virus have given variable results. In some herds where virus was used all of the cows carried calves full time, thus apparently indicating 100 per cent protection. In one small herd all of eight cows aborted one year. They were then injected with virus, bred and conceived, and only one aborted. In other herds abortion ran as high as 25 per cent after immunization of previously aborting cows. Immunization of negative heifers also showed variable results. Where bacterin was used on pregnant cows the results also varied, but in no instance was the protection apparently 100 per cent effective.

[Reports of the veterinary director general for the two years ending March 31, 1924, and the year ending March 31, 1925], G. HILTON ET AL. (*Canada Dept. Agr., Rpts. Vet. Dir. Gen., 1922–23—1923–24, pp. 50; 1924–25, pp. 38*).—These reports include accounts of the occurrence of, and control work with, infectious diseases during the years 1922–1925 (E. S. R., 49, p. 377.)

Live stock diseases report, No. 1, M. HENRY (*N. S. Wales Dept. Agr., Sci. Bul. 25 (1925), pp. 20*).—This is a report of control work with infectious

diseases of livestock in New South Wales, particularly with contagious pleuropneumonia, anthrax, and contagious mammitis.

Report of chief veterinary officer, F. MURRAY-JONES (*West. Aust. Dept. Agr. Ann. Rpt. 1925, pp. 9–12*).—Data are presented on the occurrence of and work with infectious diseases of livestock during the year.

Some recent advances in the protection of cattle and other animals against disease, I–III, J. T. E[DWARDS] (*Agr. Jour. India, 20 (1925), Nos. 4, pp. 252–269; 5, pp. 367–372; 6, pp. 429–443*).—Included in this article are (1) a discussion of some first principles in regard to disease, or, the maintenance in health, of animals, (2) Some Points of General Importance in the Hygienic Maintenance of the Domesticated Animals, including atmospheric factors, soil factors, and the drinking water supply; and (3) an account of rinderpest, including reprints from bulletins issued by the Muktesar Institute on (*a*) active immunization of cattle by means of the serum simultaneous, or serum virus method (E. S. R., 46, p. 481), and (*b*) passive immunization of cattle by means of the serum alone method.

Relative toxicity of the lupine alkaloids, J. F. COUCH (*Jour. Agr. Research [U. S.], 32 (1926), No. 1, pp. 51–67*).—Following a discussion of the earlier investigations of the pharmacology of the lupine alkaloids, the author reports at some length upon his investigation under the headings of preparation of the alkaloids, method of determining the toxicity of the alkaloids, symptoms shown by the poisoned animals, and general results, reported in large part in tabular form. He points out that the problem involved the preparation of authentic samples of the alkaloids, and the development of a method for testing their toxicity that might be standardized and applied at any future time to whatever new alkaloids might be isolated from American species of lupines.

"Authentic specimens of *d*-lupanine, lupinine, sparteine, spathulatine, and hydroxylupanine were prepared, and the toxicity of each was determined by observing the effects of different doses administered intraperitoneally to guinea pigs of standard weight. The most toxic of the lupine alkaloids is *d*-lupanine. Sparteine is slightly less toxic, lupinine is still less toxic, and spathulatine is fourth in the order of toxicity. Hydroxylupanine is but one-tenth as toxic as *d*-lupanine, and the least toxic of the five tested. The toxicity of sparteine and hydroxylupanine was also determined by subcutaneous injection in guinea pigs, and the results of these experiments are reported. It was found that the minimal lethal dose by subcutaneous injection is nearly twice that by intraperitoneal administration.

"The symptoms exhibited by guinea pigs poisoned by these alkaloids are very similar for *d*-lupanine, lupinine, spathulatine, and hydroxylupanine. The animals poisoned by sparteine exhibited muscular tremors and spasms which were not regularly shown by those poisoned with the four other alkaloids, the effects of which were purely depressant and paralyzant."

The number of generations necessary for the development of the power of aerobic growth by Bacterium abortus (Bang), A. HARMS (*Jour. Bact., 9 (1924), No. 3, pp. 273–277*).—This is a contribution from the Kentucky Experiment Station.

The author made a study of 13 different strains of *B. abortus* and found them to vary greatly in the number of generations it took to grow in the air. The cultures were isolated from fetuses and afterbirths that had been sent to the laboratory from aborting cows. The author considers it evident that the acquired character of this organism to grow aerobically is transmitted to its descendants.

The relation of Bacillus abortus from bovine sources to Malta fever, T. Smith (*Jour. Expt. Med., 43 (1926), No. 2, pt. 1, pp. 207–223*).—The author finds that comparative tests on guinea pigs with *B. abortus* give the best results when minute doses are injected subcutaneously and the animal kept at least four weeks. Under artificial cultivation its virulence for guinea pigs is gradually lost. Two cultures resembling *B. abortus* from cattle, isolated from human cases of so-called Malta fever, have been shown to be in their effect on guinea pigs not identical with the bovine strains. The results of studies of *B. abortus* from swine show a close resemblance between the porcine strains and the two human strains.

Agglutination affinities of the abortus-melitensis group of bacteria with special reference to two human strains, M. L. Orcutt (*Jour. Expt. Med., 43 (1926), No. 2, pt. 1, pp. 225–232*).—This is a contribution from the department of animal pathology of the Rockefeller Institute for Medical Research. It is concluded that, while there appears to be evidence of serological distinctions between *B. abortus* and *B. melitensis* cultures as studied by earlier workers, the experiments reported show no serological distinctions among the six strains used in the study. *B. melitensis* II and *B. melitensis* III were found to be identical with the bovine and swine strains by means of agglutination and agglutinin absorption reactions in unheated sera, by agglutination in heated sera, and with the use of heated cultures in unheated and heated sera.

Studies on Brucella (Alkaligenes) melitensis, A. C. Evans (*U. S. Pub. Health Serv., Hyg. Lab. Bul. 143 (1925), pp. VII+67, pl. 1, figs. 2*).—This consists of a series of papers, the first four of which have been noted from other sources, namely: (1) The Serologic Classification of Strains from Human, Bovine, Caprine, Porcine, and Equine Sources (pp. 1–26) (E. S. R., 50, p. 183); (2) The Nomenclature of the Melitensis-Abortus Group of Bacterial Organisms (pp. 27–32) (E. S. R., 50, p. 183); (3) Experimental Abortion in a Cow Produced by Inoculation with a Human Strain (pp. 33–35) (E. S. R., 49, p. 380); (4) Cattle as a Source of Human Infection (pp. 36–56) (E. S. R., 51, p. 283); and (5) Hogs as a Possible Source of Human Infection (pp. 57–59).

Two cultures of *B. melitensis* from human cases of Malta fever, thought to have been of hog origin, are noted, one having been received from Sioux Falls, S. Dak., and the other from New Haven, Conn. This is followed by a brief report of a case of *B. melitensis* infection in a butcher at Rocky Mount, N. C., who is known to have contracted it from a source other than the goat. A bibliography is included (pp. 60–67).

A comparison of the causative organisms of la mancha, manqueira, European and American blackleg, A. S. Schlingman (*Jour. Amer. Vet. Med. Assoc., 68 (1926), No. 4, pp. 482–493*).—A comparison of the morphology and cultural characteristics of the causative organisms of blackleg in America, Europe, Argentina, and New South Wales, and the affections known as la mancha and manqueira show that but a single form is involved. The identity of these organisms from different sources is supported by their pathogenesis and by the protection against infection of guinea pigs treated with antiblackleg serum made from American strains of *Clostridium chauvoei* as an antigen. Still further evidence of the identity of manqueira and blackleg is found in the report that cattle are protected against the former by treatment with the usual antiblackleg products.

A further note on surra transmission experiments with ticks, K. Singh (*Punjab Dept. Agr., Vet. Bul. 16 (1925), pp. 8*).—Transmission experiments with ticks, conducted in continuation of those reported by Cross and Patel in 1921 and 1923 (E. S. R., 46, p. 881; 49, p. 157), have led to the conclusion that ticks are probably incapable of directly transmitting surra, and that there is

probably a cyclical development of trypanosomes within the tick. It was found that not less than 10 ticks of the species *Ornithodorus crossii* are capable of transmitting the disease from an infected animal to a healthy one.

Tetanus, I, II, P. FILDES (*Brit. Jour. Expt. Path., 6 (1925), Nos. 2, pp. 62–70, pls. 4; 3, pp. 91–98*).—These two papers deal with the subject as follows:

I. *Isolation, morphology, and cultural reactions of B. tetani* (pp. 62–70).—A method is here described by which tetanus bacilli may be isolated easily from diverse materials. The morphological and cultural characters of *Bacillus tetani* are detailed from a study of 75 new strains isolated by this method.

II. *Agglutination and toxicity of B. tetani* (pp. 91–98).—The author reports that all of the 75 strains isolated agglutinated with sera made from 5 type strains. No example identical with Tulloch's type IV was met with. Agglutination with a polyvalent serum made from the 5 type strains is a satisfactory criterion of a tetanus bacillus. Forty-five of the new strains were toxic to guinea pigs or mice; 30 had no demonstrable toxic effect upon these animals. Spontaneous loss of toxicity may occur. It is unsafe to assume that strains nontoxic to animals are nontoxic to man.

The progress of tuberculosis eradication work, J. A. KIERNAN (*Internatl. Assoc. Dairy and Milk Insp. Ann. Rpt., 14 (1925), pp. 115–127*).—A report of progress, presented in October, 1925.

Management—a factor in combating avian tuberculosis, L. D. BUSHNELL and W. R. HINSHAW (*Poultry Sci., 5 (1925), No. 1, pp. 35–52, figs. 3; 5 (1925–26), No. 2, pp. 78–97, figs. 6*).—In this contribution from the Kansas Experiment Station, the authors review the literature relating to the subject, in connection with a bibliography of 53 titles, and draw definite conclusions. They discuss the distribution of the disease, its economic importance, etiology, the transmutation of types of tubercle bacilli, the relation of avian tuberculosis to tuberculosis of mammals, the relation of avian tuberculosis to the disease in man, the mode of transmission to other birds, the relation of the mammalian type organism to avian tuberculosis, symptoms in birds, lesions in birds, diagnosis, differential diagnosis, tuberculin test, and control of a tuberculous flock.

A report of experimental work on the bull as a factor in the spread of infectious abortion, R. E. LUBBEHUSEN and C. P. FITCH (*Jour. Amer. Vet. Med. Assoc., 68 (1926), No. 4, pp. 467–481*).—This is a contribution from the Minnesota Experiment Station. The authors find that bulls are not readily infected by way of the natural channels of infection, namely, by mouth or by way of the urethra. This conclusion is supported by clinical observations and serologic tests, in which only a small percentage of bulls show active infection.

"Many bulls giving a positive reaction to the serologic tests for infectious abortion do not harbor *Bacterium abortus* Bang in the genital organs. Repeated examination of the semen of those bulls known to harbor the organism in the genitalia (the result of artificial infection) failed to show the presence of *B. abortus*. Although the data presented on channels of infection in heifers are not sufficient to warrant definite conclusions, they add to the experimental evidence that heifers are not readily infected by way of the urethra and posterior vagina."

Practical results of attempts to control abortion disease, B. T. SIMMS and F. W. MILLER (*Jour. Amer. Vet. Med. Assoc., 68 (1926), No. 4, pp. 455–461*).—This is a contribution from the Oregon Experiment Station, presented at the annual meeting of the American Veterinary Medical Association at Portland, Oreg., in July, 1925. The authors report that they were unable to control abortion disease through temporary isolation of aborting cows, destruction of aborted fetuses and their membranes, and disinfection of stalls in which abortions occurred. They were also unable to control the disease by

separating the reacting animals from the negative animals, but keeping them in the same barn. The adoption of a method similar to the Bang system in tuberculosis control gave results satisfactory to the owner as well as to the veterinarians. The average milk production per cow in the infected group was 35 per cent less than in the abortion-free group.

The sterility of cows [trans. title], S. FREUND and A. ROSEN (*Zionist Organ. Inst. Agr.* [*etc.*] *Agr. Expt. Sta. Ext. Circ. 4* (*1925*), *pp. 10*).—A brief discussion of the cause of sterility in cows and means of prevention.

A study of Bacillus acidophilus from the digestive tract of calves, M. L. ORCUTT (*Jour. Bact., 11* (*1926*), *No. 2, pp. 115–127*).—The author here reports upon investigations conducted by the department of animal pathology of the Rockefeller Institute for Medical Research. He finds that *B. acidophilus* types are always present throughout the small intestine of young calves and are the predominating forms in the fourth stomach.

"In normal animals they are the predominating organism in the small intestine or they occur in more or less equal numbers with Gram-positive cocci. *B. acidophilus* multiplies in the small intestine of normal calves, but the degree of multiplication is greater in the fourth stomach than in the intestine. Ordinary standard agar of pH 6.8 to 5.0 plus horse blood proved a suitable medium for the isolation of these organisms. Agar pH 6.8 is the most favorable for abundant growth, but the more acid agar is better whenever colon organisms are numerous.

"All the recently isolated calf strains showed certain characters in common, such as (1) similar optimum and limiting H-ion concentrations, (2) development of small greenish zones on blood agar, (3) growth throughout a layer of agar 12 cm. deep, (4) no liquefaction of gelatin, (5) coagulation of milk at definite pH values and final H-ion concentrations after three weeks, varying with the amount of material inoculated, (6) production of acid from glucose, lactose, sucrose, and maltose. The strains differed in the fermentation of mannitol; one strain produced a small amount of acid from this sugar, and all the other strains failed to ferment it. The calf strains may be divided into two groups according to gas production, (1) nongas types, *B. acidophilus*, and (2) gas types, *B. acidophilaerogenes*. *Acidophilaerogenes* strains are characterized by variation in the rate and amount of gas production, and the gas is always CO_2. Experiments with *B. acidophilus* and *B. coli* in mixed culture, taken together with certain biological characters, indicate that *B. acidophilus* possesses a greater resistance to acid than *B. coli*. The calf strains correspond in general in biological characters to *B. acidophilus* types isolated from man and other animals by earlier observers."

The prevention of strangles, J. T. EDWARDS (*Jour. Compar. Path. and Ther., 38* (*1925*), *No. 4, pp. 256–266*).—This is a report of results obtained during the seasons from 1922 to 1925 by the director of the Imperial Institute of Veterinary Research, at Muktesar, India. He found that the facts presented appear to indicate that attempts should be made to combat strangles by resorting to other means than streptococcic products. Whether the morbid products of the disease can be suitably treated and still retain a specific factor capable of evoking an immunity response, or intervention similar to that employed in certain diseases due to ultravisible viruses can be adopted with success, remains to be determined.

On the cestode genus Dipylidium from cats and dogs, T. M. MILLZNER (*Calif. Univ. Pubs. Zool., 28* (*1926*), *No. 17, pp. 317–356, pls. 7*).—Twenty-two species of Dipylidium are recognized, of which 5 are described as new to science. The account includes a list of 22 references to the literature cited.

Parasitic nematodes from China, B. SCHWARTZ (*U. S. Natl. Mus. Proc., 68 (1926), Art. 13, pp. 10, figs. 3*).—The list here presented includes records of nematodes new to China.

AGRICULTURAL ENGINEERING

Hydraulics and its applications, A. H. GIBSON (*New York: D. Van Nostrand Co., 1925, 3. ed., pp. XV+801, figs. 427*).—This is the third edition of this book. It contains sections on physical properties of water—hydrostatics, hydraulics, and hydraulic machinery.

Annual report of the Commissioner of Reclamation (*U. S. Bur. Reclam. Ann. Rpt., 24 (1925), pp. 178, figs. 8*).—This report summarizes the work of the U. S. Department of Interior Bureau of Reclamation for the fiscal year ended June 30, 1925.

Evaporation on United States reclamation projects, I. E. HOUK (*Amer. Soc. Civ. Engin. Proc., 52 (1926), No. 1, [pt. 3], pp. 41–61, figs. 4*).—This paper summarizes the evaporation investigations of the U. S. Department of Interior Bureau of Reclamation.

Surface water supply of the United States, 1922, Parts 2, 3, 6, 12 (*U. S. Geol. Survey, Water-Supply Papers 542 (1926), pp. IV+74, pls. 2; 543, pp. VI+262, pls. 2; 546, pp. VII+349, pls. 2; 552, pp. V+203, pls. 2*).—These papers present the results of measurements of flow made on streams in the following basins during the year ended September 30, 1922: Parts 2, South Atlantic Slope and Eastern Gulf of Mexico Basins; 3, Ohio River Basin (in cooperation with the States of West Virginia, Ohio, Illinois, Kentucky, Tennessee, and North Carolina); 6, Missouri River Basin (in cooperation with the States of Montana, Wyoming, Iowa, Colorado, Missouri, and Kansas); and 12, North Pacific Slope Drainage Basins.—A, Pacific Basins in Washington and Upper Columbia River Basin (in cooperation with the States of Washington and Montana).

Irrigation investigations [at the Irrigation Substation] C. C. WRIGHT (*Washington Col. Sta. Bull. 196 (1925), pp. 64–71, figs. 4*).—Observations to compare water-measurements on a stream passing over a 2-ft. Cippoletti weir with measurements on the same stream recorded by a submerged orifice irrigation meter indicated that the meter is probably as accurate a measuring device as the weir. Data from duty of water experiments are briefly presented.

Studies of water relations of the soil in the field showed that the field water-holding capacity of the soil from 24 to 48 hours after irrigation was 2.77 in. per foot for the first foot, 3.52 in. for the second foot, and 3.27 in. for the third foot. The average loss of moisture per day from these plats was directly proportional to the amount of irrigation water added.

Fall irrigation experiments with alfalfa and corn showed that the yields from the alfalfa plats did not show noticeable increases or decreases due to fall irrigation. The corn plats, however, which were not irrigated in the fall and were irrigated in the spring before planting, produced an average yield of 61.5 bu. per acre as against an average of 49.8 bu. per acre for the plats which were fall irrigated and not spring irrigated.

Data on the average ground water elevations in an experimental tract for each month during a period of three different years are graphically reported.

Experiments on the effects of drying the soil at a temperature of 105° C. on its electrical conductivity showed that differences in conductivity due to drying are well within the experimental error of the methods used for determination. A series of observations to determine the weight of a cubic foot

of soil at different depths showed a wide discrepancy in the final weights due to a lack of refinement in the methods, but agreed in showing that the weight of the soil increases in the lower horizons.

The irrigation problem in Kansas, G. S. Knapp (*Kans. State Bd. Agr., Bien. Rpt., 24 (1923–24), pp. 121–133, fig. 1*).—An analysis of the irrigation problem in Kansas is presented. Attention is drawn to the fact that Kansas exercises little or no regulatory control over the use of irrigation water. Most of such irrigation water is secured by pumping. An analysis of the factors entering into the production of several crops indicates that the yield of dry matter per unit of water has in most instances decreased as larger amounts were applied. It was not found, however, that the amount of water which produced the greatest unit yield produced the greatest net profit. It is concluded that the problem of irrigation in the State resolves itself into one of showing the relative importance of the various factors entering into the cost of the irrigated crop, and thus encouraging the use of larger amounts of water.

The capacity of irrigation and drainage wells, H. E. Murdock (*Montana Sta. Bul. 182 (1925), pp. 16, figs. 3*).—Data are presented to show the behavior of irrigation and drainage wells that are in actual use and giving satisfactory service, and to indicate what may be expected under similar conditions. The data are for dug irrigation wells with diameters ranging from 2.5 to 16 ft. and for drilled wells with diameters ranging from 1 to 2 ft.

The values of the specific capacities for the dug wells were found to vary from 0.037 to 0.39 cu. ft. per second per foot of draw-down; that for the drilled wells varied from 0.022 to 1.04. The results indicated that for practical irrigation and drainage wells there is no apparent definite relation between the amount of water a well will yield and its diameter. For a given well there is a definite relation between the yield and the draw-down as shown by the characteristic curve. This relation is expressed quantitatively by the specific capacity. The data do not indicate that in new pumping districts dug wells of large diameter will give a greater yield than drilled wells.

It was found further that the greater the total thickness of the water-bearing strata penetrated by a well the larger will be the yield for a given draw-down. It is for this reason that wells of large capacity are frequently drilled several hundred feet deep, although the water table may stand within a few feet of the surface. When wells are drilled where the water-bearing strata are not encountered until the shaft has been sunk rather deep, the water usually rises in the shaft above the point where the water-bearing stratum was first touched.

A new idea in drainage for the irrigation farmer, J. C. Marr (*Agr. Engin., 6 (1925), No. 12, pp. 306, 307, figs. 5*).—In a contribution from the U. S. D. A. Bureau of Public Roads the drainage of certain water-logged soils by the sluicing or hydraulic method is briefly described. The necessary requirements for this process are that water for sluicing be available in large quantities in favorable locations and at a low cost, that the slope of the land along the line of location of the drainage ditch be somewhat greater than is usually available where drainage is necessary, and that the soil to be excavated be easily susceptible of transportation by water.

Federal legislation providing for Federal aid in highway construction, the construction of national forest roads and trails, and the distribution of surplus war materials. Rules and regulations of the Secretary of Agriculture for carrying out the Federal Highway Act and amendments thereto. Rules and regulations for administering forest roads and trails (*U. S. Dept. Agr., Misc. Circ. 60 (1925), pp. [1]+30*).—The texts of the legislation and of the rules and regulations are presented.

The transportation of logs on sleds, A. M. KOROLEFF and R. C. BRYANT (*Yale Univ. School Forestry Bul. 13 (1925), pp. 110, pls. 13, figs. 35*).—The results of an investigation on the development of sled hauling methods in the logging industry are reported in considerable detail. Sections are included on logging methods in the northern United States, sled roads, the construction of sled roads, the maintenance of sled roads, logging sleds, loading sleds, power used in sled transportation, factors controlling the size of sled loads, and animal v. mechanical draft.

Tests of carbon deposition in internal-combustion engines, D. R. BROOKS (*Jour. Soc. Automotive Engin., 18 (1926), No. 1, pp. 48–52, figs. 5*).—The results of an investigation of the formation of carbon in an internal-combustion engine and its influence on the performance of the engine are reported.

It was found that special methods of controlling the character and quantity of lubricating oil that reached the combustion chamber were necessary to obtain concordant results on successive tests. It was further found that carbon formed in internal combustion engines arises from thermal decomposition and oxidation of the lubricating oil. Factors that influence the rate of deposition of carbon are those which affect the quantity and character of the lubricating oil that reaches the combustion chamber and its rate of break down in that chamber.

An increase in carbon deposit increases the indicated thermal efficiency of an engine, and the gain in efficiency is proportional to the increase in the carbon deposit. An increase in absolute humidity in the air-fuel mixture appears to increase the indicated thermal efficiency of an engine.

It is concluded that the total quantity of carbon that would be formed in unlimited time is dependent upon the conditions of engine operation.

Dilution effects on friction coefficients and bearing temperatures, A. LER. TAYLOR (*Jour. Soc. Automotive Engin., 18 (1926), No. 1, pp. 41–45, figs. 10*).—Tests conducted at the University of Utah on the degree of crankcase oil dilution beyond which it is unsafe to run an engine bearing are reported.

In general the results of the test indicate that dilution of the crankcase oil up to 50 per cent has no bad effect upon the engine as regards increased friction and temperature of the bearings, although it may be injurious from other standpoints. It appears that dilution of the oil does not affect the friction or the bearing temperature materially so long as a film of oil can be maintained between the surfaces, but that when this film breaks down both friction and temperature increase. The tests indicate that the film does not break down until the oil becomes highly diluted if the pressure is low. When the pressure is increased the diluted oil seems to be squeezed out from between the surfaces more easily, so that friction and temperature are higher. It appears also that in the case of light oils the film breaks down more easily than in the case of heavy oils. It was found that in starting with a dry bearing considerable time is necessary for the establishment of the film between the two surfaces, but as soon as the film is once established conditions remain constant. The tendency to attribute burned-out bearings and scored cylinders to dilution of the oil is not considered fully justifiable.

Properties of typical crude oils from the producing fields of the Western Hemisphere, A. J. KRAEMER and L. P. CALKIN (*U. S. Dept. Com., Bur. Mines Tech. Paper 346 (1925), pp. II+43*).—This paper contains analyses of representative samples of crude petroleum from the producing fields of the Western Hemisphere outside the United States. On the basis of the analyses and the sampling data, the crudes are divided into groups and their characteristics discussed.

Work of the Kansas Committee on the Relation of Electricity to Agriculture, H. B. WALKER (*Kans. State Bd. Agr., Bien. Rpt., 24 (1923–24), pp. 144–152, figs. 9*).—The proposed program of work of this committee is outlined.

A study of the isolated farm electric plant, D. C. HEITSHU and F. M. SOMMERVILLE (*Agr. Engin., 6 (1925), No. 12, pp. 292–294, figs. 4*).—Studies conducted at the Virginia Experiment Station on the cost of electric light and power secured from the isolated farm electric plant, on the comparative merit of battery and nonbattery plants, and on the service value of such plants are reported.

The cost of current from these plants was found to be exceedingly high. It appeared that over a period of time the cost of current from the nonbattery type of plant is cheaper than from the battery plant. The conclusion is drawn that the individual farm electric light and power plant is a very satisfactory piece of farm equipment, but that a large field for improvement and development is presented in both battery and nonbattery types of plants.

Experiments on milking cows by machinery [trans. title], R. BERGE (*Compt. Rend. Acad. Agr. France, 10 (1924), No. 11, pp. 372–375; abs. in Internatl. Rev. Sci. and Pract. Agr. [Rome], n. ser., 2 (1924), No. 3, p. 709*).—Tests of a milking machine on 16 cows are reported.

None of the cows objected to the machine. Eleven of them were thoroughly milked, but 5 kept back their milk either partially or entirely. In the case of the first 11 cows, 4.58 per cent of the total amount of the milk was drawn by hand stripping in the morning and 5.58 per cent in the evening. This milk contained from 2 to 6 times more fat than the milk obtained by means of the machine. If the time required for hand stripping afterwards is added, machine milking takes twice as long as milking entirely by hand. It was found that a cow keeper can easily supervise 4 machines. It required only 3 minutes to change the cow, hand strip, weigh the milk, and pour it into other receptacles. A little more milk was obtained by machine milking, followed by hand stripping, than if the whole operation was carried out by hand.

The effect of threshing upon wheat [trans. title], O. MUNERATI (*Compt. Rend. Acad. Agr. France, 10 (1924), No. 15, pp. 469–473; abs. in Internatl. Rev. Sci. and Pract. Agr. [Rome], n. ser., 2 (1924), No. 3, p. 708*).—A brief summary of studies on the injury to grain by mechanical threshing is presented.

It was found that the injury sustained by Italian seed wheats from machine threshing ranged from 2 to 4 per cent, and is considered to be practically negligible. On the other hand, experiments in Switzerland showed injury ranging from 20 to 26 per cent. It is concluded that the solution of the problem varies according to the case, and the suggestion is advanced that the different rates of threshing may be one of the causes of the variations in the number of grains that are broken during threshing operations.

A thresher for single heads of grain, A. H. HOFFMAN (*Agr. Engin., 6 (1925), No. 12, pp. 297, 308, figs. 3*).—In a contribution from the California Experiment Station a thresher for single heads of grain is described which is adapted for use by agronomists in experimental plant breeding work. The machine is extremely simple, and the threshing cylinder is directly mounted on the motor shaft. A toothed concave is not used. This enables higher tooth-tip speeds without cracking of the grain. Sloping bars are inserted in the housing to prevent any possibility of whole heads being blown by without being hit by the cylinder teeth. The threshing cylinder and its teeth constitute the only blower, and the blast is entirely adequate to remove the chaff. The operator's hand that puts the head or heads into the machine acts as a cover to prevent any kernels from jumping out. The specifications for this machine are presented.

Static electricity in stationary threshers, C. C. JOHNSON (*Washington Col. Sta. Bul. 196 (1925), pp. 11, 12*).—It is stated that a continuation of this work has shown that the static electricity in stationary threshers occurs between the straw and the machine rather than between the parts of the machine, and that the problem is rather to neutralize the static in the body of the machine than to ground the machine. There appears to be some relation between static conditions and humidity which may point to a means of controlling smut explosions.

Dust control in grain elevators, H. R. BROWN and J. O. REED (*U. S. Dept. Agr. Bul. 1373 (1926), p. 48, figs. 37*).—Office, field, and laboratory studies for the purpose of developing means for the control of dust in grain elevators are reported.

It has been found that the dust conditions in a grain elevator are effectively controlled only when (1) dust clouds are eliminated at their point of origin by the application of suction, (2) dust accumulations are promptly removed from the building either by a vacuum-cleaning system or by a floor-sweep system, and (3) the elevator and equipment are well ventilated. The mechanical methods of controlling dust conditions were therefore divided into dust collection and dust removal in the investigation. A large amount of mechanical and technical details is presented.

It is concluded that dust collection in grain elevators may not prevent explosions, but that it will keep a small dust ignition from developing into a disastrous explosion. As the result of these experiments with special laboratory equipment, a new dust-handling equipment has been designed which should meet all objections to the installation of such systems on the ground that they affect the weight of the grain.

The measurement of humidity in closed spaces, J. A. EWING, R. T. GLAZEBROOK, ET AL. (*[Gt. Brit.] Dept. Sci. and Indus. Research, Food Invest. Bd., Spec. Rpt. 8 (1925), pp. VI+54, pls. 2, figs. 34*).—The results of an investigation into the question of measuring the humidity of the atmosphere in closed spaces are reported, including an account of experiments on existing types of hygrometers and a description of novel methods and instruments designed to meet special requirements. These results would seem to have a bearing on studies connected with the development of ventilation and crop storage systems.

Ventilation and its relation to wet litter, J. S. CARVER (*Washington Col. Sta. Bul. 196 (1925), pp. 37, 38*).—Studies of the ventilation of poultry houses showed that there was practically no difference in the winter, especially during the cold weather, in the temperature and relative humidity in two pens of equal size, one with and the other without a straw loft. However, during the warm weather the straw loft pen was about 5° cooler than the pen without a straw loft. The amount of moisture in the litter in the straw loft pen was very heavy, being often 30 per cent within a week's time. The straw loft averaged about 12 per cent moisture content, and it appeared that the straw in the loft did not absorb any moisture from the litter.

During the winter months the temperature and relative humidity of open front houses averaged about 5 per cent higher than those on the outside. They were about the same during the summer months.

RURAL ECONOMICS AND SOCIOLOGY

The management of the farm, L. A. MOORHOUSE (*New York and London: D. Appleton & Co., 1925, pp. XVII+526, figs. 63*).—This presentation of the problems of farm management is centered about the following principles: (1) The type of farming and its organization may be modified and, to a certain

extent, controlled by one or more external or internal factors. (2) Many of the special types of farming which have developed in the United States not only differ in their requirements of land, labor, and capital, but show considerable variation in the organization of different farms within the same type. (3) The successful operator concerns himself not only with problems of the seasonal distribution of labor, farm layout, the selection of enterprises, and other factors directly related to the management of his business, but he takes into consideration the various practices that are involved in working out a yearly program. (4) The operator must be prepared to compare and draw definite conclusions with respect to production costs and market prices.

The material is presented in three parts, the first of which sets forth the geographic, economic, and social conditions which predetermine the type of farming. Part 2 discusses adjustments in farm organization and operation from the individual and the national viewpoint. Chapters are devoted to the conduct of farms organized for the production of specific crops and livestock. This comprises approximately one-half of the book. In part 3 are presented some of the economic problems which confront the farm operator. Numerous references are cited for each of the 27 chapters.

Cost of producing beef on the ranges of eastern Oregon, E. L. Potter (*Oregon Sta. Bul. 220 (1925), pp. 3–32, figs. 3*).—This is a discussion of the factors which enter into the cost of beef production based upon surveys of the cattle industry, particularly in the Blue Mountain region and sections of eastern Oregon similar to it, and on experiments in cattle raising under range conditions. Costs are classified as operating and investment expenses.

The bill as a whole for running a mixed herd of cows, calves, yearlings, and 2-year-olds from October to October is given as $21.40 per head. If the cattle are run entirely on fenced, deeded land, the total is $24.54, while on free range it is $16.10, although on the basis of cattle sold, since the turnover is low, the final cost is not materially different from what it is in regions without free range. Two-year-old grass-fed steers cost per hundredweight $9.75, winter-fed steers for April delivery $11.50, and 2-year-old grass-fed cows $8. The loss on the 2-year-old steers was $3.50 per hundredweight at the average price in 1922–1924 and $2.75 in 1925, while on winter-fed steers it was $4.50 and $3. The present situation is attributed to the subnormal price of the finished product rather than to abnormal costs of production.

Cost of producing mutton and wool on eastern Oregon ranges, E. L. Potter and H. A. Lindgren (*Oregon Sta. Bul. 219 (1925), pp. 3–13, figs. 4*).—The estimates presented here are intended to indicate the financial status of the sheep business and to illustrate methods of estimating costs of production. With wool at 40 cts. a pound, the cost of producing feeder lambs is estimated at $9.24 per hundredweight and that of early fat lambs $9.90. With fat lambs at $10.50, feeders at $10, fall prices, and wool at 40 cts., sheep are paying $8 a ton for hay, $1.62 a year for grass, wages, and 8 per cent on the livestock investment. The cost of producing lambs for the winter market increases 50 cts. per hundredweight for each month after the grazing season is past.

Income in the various States: Its sources and distribution, 1919, 1920, and 1921, M. Leven (*Natl. Bur. Econ. Research [New York] Pub. 7 (1925), pp. 306, figs. 17*).—This volume presents statistically the more salient factors pertaining to the income of the people of the United States, its sources, and geographic distribution on the basis of estimates of the national totals by W. I. King. Limited analytical discussion is given of certain important items, although most of the material appears in the form of tables. The chapters dealing specifically with agriculture cover agricultural receipts,

agricultural expenses, and the distribution of the agricultural income of farmers and nonfarmers.

Farm organization and farm profits in Tama County, Iowa, C. C. TAYLOR and E. B. HURD (*Iowa Sta. Research Bul. 88 (1925), pp. 255–322, figs. 3*).—Surveys of individual farms were conducted in 1913, 1918, and 1921, years representative of pre-war conditions, war-time prosperity at its height, and post-war depression at its worst. Gross farm income was determined and farm expenses deducted to give net farm income. Deductions were made from the latter in the way of allowances for interest on the farmer's investment in working capital, wages of the farmer and his family, and the rent of his land, the rest being termed profits. Multiple correlation was used in studying the influences affecting the farmer's profits and losses, and the coefficients derived are given in an appendix.

Part 1 of this publication describes the prevailing types of farm organization under the heads of size of farm, land utilization, crop yields, methods of disposing of the crops and silage, and purchases and sales of crops. The livestock systems and farm equipment are also set forth in detail.

Part 2 consists of a financial analysis of the farms surveyed, considering business assets, farm income, expenses, and profits and losses. The following table gives a summary of the data:

Income, expenses, and profits on Iowa farms in 1913, 1918, and 1921

Item	1913	1918	1921
Gross cash rent	$1,034	$1,534	$2,047
Land charges	362	579	919
Net rent	672	955	1,128
Current expense	906	2,186	1,740
Depreciation	254	497	588
Interest on working capital	372	567	483
Family and proprietor labor	743	1,121	1,246
Total expense and allowances [1]	2,947	5,326	5,185
Gross income	4,025	7,979	3,835
Farm profit	1,078	2,653	−1,350

[1] For unpaid labor, land use, etc.

The study indicates that there have been only slight changes in the basic organization of farms in this area in the eight years. Such changes as have been brought about have been mainly in the livestock program. There may be variations in the organization of individual farms in the matter of nonessentials, but very little in the percentage devoted to corn, around which all the rest of the cropping system is built. The region is fairly prosperous under ordinary economic conditions. The resources are excellent, and the technique of farming reflects a fairly good adjustment to them.

Agricultural production and marketing in Lebanon County, Pennsylvania, A. C. BERGER, P. R. TAYLOR, B. H. CRITCHFIELD, and R. S. KIFER (*Pennsylvania Sta. Bul. 198 (1925), pp. 48, figs. 12*).—This is a report of the results of a survey of agricultural conditions in Lebanon County, Pa., made for the purpose of furnishing an economic basis for a production and marketing program. Records were obtained for the year ended June 30, 1924, from 163 farms selected as representative of general farm conditions and prevailing production and marketing practices.

Sales of dairy products amounted to 38 per cent of the total farm receipts on the farms studied, crops 27, poultry 18, beef cattle 10, and hogs 7 per cent.

Census and other data have been assembled to indicate the extent of crop, livestock, fruit and vegetable, and dairy production, marketing, and consumption. General marketing methods and practices in the city of Lebanon are described. An appendix gives tabulated statistics.

A study in Vermont dairy farming, J. A. Hitchcock (*Vermont Sta. Bul. 250 (1925), pp. 3–48, pls. 2, figs. 10*).—Analyses of their farm business were obtained from farmers in the adjacent towns of Randolph and Royalton in central Vermont for the two years ended March 31, 1923. The region was deemed representative of Vermont as a whole, being predominantly a dairy section, producing potatoes and hay as cash crops and a small amount of fruit.

Share and cash renters together occupied only 10 out of the 232 farms investigated. An appreciable increase is noted in the proportion of owner-operated farms that are mortgaged, especially from 1910 to 1920.

The years for which the study was made were difficult ones, yet 17 farmers cleared from $1,000 to $5,000 for their year's labor, and 20 made 10 per cent or better on their investment. The receipts from cattle and cattle products amounted to 67.3 per cent of the total farm receipts. Cattle and hogs combined accounted for 74.3 per cent of the gross receipts. The factors found to have a bearing on returns to dairy farmers are the quality of livestock, the economical use of man and horse labor, the size of the crop yields, the distribution of investment, the intensity with which the land is stocked, the heaviness of the capitalization, diversification, and the size of the business. These are discussed in detail, and tables and graphs are presented showing the relationships between the various items and trends. The following table gives the coefficients:

Summary of correlation coefficients

Factor	Coefficient of correlation with labor income
Quality of livestock	0.569±0.033
Use of labor	−.418± .040
Capitalization	.305± .045
Quality of crops	.247± .046
Use of horses	.240± .046
Amount of labor employed	.240± .046
Distribution of investment	.211± .047
Relation of stock carried to tillage land	.175± .048
Diversification	.108± .048

Land tenure and unemployment, F. Geary (*London: George Allen & Unwin, 1925, pp. 256*).—Certain facts of the history of the land question in England are reviewed. Particular attention is given to the relationship which has existed at various times since before the Norman Conquest between unemployment and the availability of land as dependent upon the system of tenure prevailing. Inclosures of waste and common land resulted in a curtailing of common rights and a restriction of the opportunities of employment. About the middle of the fifteenth century a definite surplus of unemployed labor appeared. In the middle of the eighteenth century the last and greatest period of inclosures began, and this marked the wholesale depopulation and devastation of the countryside. Insecurity of tenure, the difficulty of obtaining small holdings, game preserves, the conversion of arable to pasture, high land prices, and other causes are held to be contributory to the agricultural depression, land monopoly, and unemployment which prevail at the present time.

Index numbers of freight rates and their relation to agricultural prices and production, H. S. GABRIEL (*New York Cornell Sta. Bul. 446 (1925), pp. 37, figs. 8*).—Two common methods of measuring changes in freight rates have been the calculation of the relatives per ton-mile for all revenue freight carried by the railroads and the compounding of the percentage changes in rates. The first is said not to show actual rate changes correctly, due to the fact that different types of commodities take different scales of rates. Consequently the relative proportion of those commodities taking high rates and those taking low rates would have a decided effect on the freight revenue per ton-mile. Furthermore, the length of haul has increased, and, since long hauls return a lower revenue per ton-mile than do short ones, it is not fair to compare the revenue relatives for periods when length of haul differed.

The calculation of percentage changes fails to include nonpercentage changes and makes the rate level appear higher than it really is. Certain advantages of index numbers are pointed out, and five series of such numbers are presented in numerous tables. One of these is based on the history of 50 rates on 15 commodities and shows the fluctuations since 1900. The other four show the fluctuations in rates on wheat for each of the geographical areas from which it is shipped.

Rates appear to have increased more in the East than in any other part of the country both from 1900 to 1913 and from 1913 to 1922 and to have declined more in the far West from 1900 to 1913 than in any other region. The rates in the eastern group of States have increased steadily since 1900. Western rates, especially those in the far West, tended to decrease from 1900 to 1913 and increased much less from 1913 to 1922 than did eastern ones.

The fluctuations in the proportion of the commodity absorbed by transportation rates are shown for a number of commodities, indicating a tendency in freight rates to lag behind prices, both on the upward and downward trends. This tendency necessitates much adjustment in agricultural production.

It is indicated that during the years just preceding 1921 increases in land values were much greater in the States that depend most completely upon transportation costs for their prosperity. During periods of high prices and low freight rates, as in that one from 1913 to 1921, western States gained in prosperity more than did eastern States, although their prosperity was temporary.

Warehousing, H. A. HARING (*New York: Ronald Press Co., 1925, pp. VIII+787, figs. 15*).—Information has been compiled showing for each important type of warehouse its special requirements; the peculiar conditions surrounding it, with respect to freight movement, borrowing, and insurance; the statutory regulations of the several States; the warehouse rules of such trading exchanges as apply; and the schedule of charges both for storing goods and for incidental services.

The cooperative advertising of farm products, D. FRANCISCO (*[Los Angeles: Lord & Thomas, 1925], pp. 58, figs. 11*).—Some of the results of experience in the national advertising of certain western horticultural products are recounted.

Crop report regulations (*U. S. Dept. Agr., Misc. Circs. 20 (1923), pp. 4; 64 (1926), pp. 4*).—The regulations effective on and after January 1, 1924, and January 1, 1926, governing the publication of reports and the information utilized in the compilation of reports prepared by the Bureau of Agricultural Economics concerning acreages, conditions, yields, farm reserves, or quality of products of the soil grown in the United States, are reproduced here.

The agricultural outlook for 1926 (*U. S. Dept. Agr., Misc. Circ. 65 (1926), pp. 32*).—This, the fourth annual outlook report, has been prepared by the staff of the Bureau of Agricultural Economics and others in an effort to supply facts and an interpretation of the probable future trends of demand and supply for agricultural products, taking into consideration world-wide and national conditions.

The farming industry is held to be, as a whole, in its best general position since 1920. Little likelihood is evidenced of a greater domestic demand for farm products in 1926 than existed in 1925, and the prospects are that the demand in foreign markets for most of our farm products will be no better than in 1925, if as good, unless the competing products of foreign countries should be reduced by an unfavorable season. Ample credit will be available at rates about the same as in the preceding year. No changes are anticipated in the supply of farm wages or in farm wages rates.

The situation is discussed in some detail as regards these factors and each of the important farm products.

The world wheat situation, 1924–25: A review of the crop year, J. S. DAVIS, A. E. TAYLOR, ET AL. (*Food Research Inst. [Stanford Univ.] Wheat Studies, 2 (1925), No. 1, pp. 64, figs. 17*).—This is a summary and interpretation of the more important phases of the wheat situation in the crop year 1924–25, presented on the basis of more complete data than were available when previous reports were made (E. S. R., 53, pp. 593, 594, 796; 54, p. 287).

The world wheat situation, August to November, 1925, J. S. DAVIS, A. E. TAYLOR, ET AL. (*Food Research Inst. [Stanford Univ.] Wheat Studies, 2 (1925), No. 2, pp. 65–100, figs. 7*).—This survey of the first four months of the international crop year reveals the facts that the volume of international trade and especially the volume of overseas trade will be much smaller this year than last, the level of world wheat prices for the next few months will be *definitely higher than the September level, and at this higher level the import* requirements of importing countries as a whole will be reduced.

The agricultural geography of the Salt Lake Oasis, C. L. WHITE (*Jour. Sci. Labs. Denison Univ., 21 (1925), Art. 4, pp. 117–283, figs. 34*).—This thesis embodies a study of agricultural adjustments to environmental conditions. A brief sketch is given of the history of the Mormon migration to and settlement of the valley of the Great Salt Lake. The geographical unity of this region at the foot of the Wasatch Mountains is pointed out. The utilization of land, especially for crops, is analyzed, and some forecast as to what the situation may be in the future is attempted. Details of the use of the land for crops, pastures, and forests; the livestock industry; manufacture of agricultural raw materials; and commerce in agricultural products are presented in sections 4 to 9, inclusive.

The small size of farms has encouraged the development of intensive tillage under irrigation, and a habit of dwelling in numerous small villages has grown up. Grain farming has been supplanted by sugar beet and alfalfa growing, dairying, truck farming, and general stock rearing. The old pioneer irrigation systems have become unsuitable and inadequate and need to be replaced as soon as practicable. Attention must be given to flood control. Cheaper land and larger and more accessible markets are both needed at the present time. The systems of agriculture of landholding under which the region was first settled were admirably suited to the natural environment, but serious limitations have been revealed under later conditions.

Agriculture in the Charolais region, R. BOIVIN (*La Fortune Agricole du Charolais. [Paray-le-Monial: Impr. Nouvelle, 1924], pp. [5]+260, pls. 17*).—Natural and economic conditions, the crops and livestock produced, and the

local industries of a region in the district of Saône-et-Loire, France, are described.

The agricultural survey of Europe: Italy, A. HOBSON ET AL. (*U. S. Dept. Agr., Bur. Agr. Econ., Foreign Sect. Rpt. 35 (1925), pp. 93*).—This analysis, in mimeographed form, of the trend of agricultural production in Italy is a study of production and trade statistics, with comparisons where possible of pre-war and post-war periods. Also the available data are reviewed and summarized to show the gross value of agricultural products, imports and exports, the agricultural labor situation, the possibilities and limitations of land reclamation, the use of fertilizers, and land tenure. An appendix gives the text of measures taken by the Italian Government in conducting the "Battle of Grain" to increase the national production.

The syndicalism movement in agriculture, P. JAHAN (*Le Mouvement Syndical Agricole. Bourges: Impr. des Orphelins du Centre, 1924, pp. 116, pl. 1, fig. 1*).—Four distinct periods in the history of the movement for the organization of agricultural interests in France are covered in the first part of this study. The second deals with the functions and the organization of agricultural syndicates; the third with the machinery of operation of organizations for buying and selling and providing credit, labor bureaus, and societies for technical education. Insurance and other mutual aid societies are also discussed. In conclusion some of the obstacles in the way of further development are considered, particularly in the light of anticipated future progress.

Fifth report of the activities of the Agricultural Council [Denmark] [trans. title] (*Beret. Landbr. Raadets Virks. [Denmark], 5 (1924), pp. 144+964, figs. 24*).—The marketing abroad of Danish agricultural products, prices, credit arrangements, and other matters which were studied or administered in the year 1924 by this official body are reported upon.

Minutes of the meetings of the permanent committee [of the International Institute of Agriculture], 1923 [trans. title] (*Inst. Internatl. Agr. [Rome], Com. Perm., Proc. Verb. 1923, pp. [2]+694*).—The minutes of 13 sessions of this committee held between January 5 and December 19, 1923, inclusive, are published here.

The relation between the ability to pay and the standard of living among farmers, E. L. KIRKPATRICK and J. T. SANDERS (*U. S. Dept. Agr. Bul. 1382 (1926), pp. 32*).—Data here presented were obtained from 861 schedules taken in selected localities of Kentucky, Tennessee, and Texas by the Department, with the cooperation of the State colleges of agriculture in Kentucky and Tennessee. Estimates were obtained, usually from the farm operator, of the receipts and expenditures in connection with the operation of both the farm business and the farm home for the year ended December 31, 1919.

Of the expenditures as classified, food expenditures were found to amount to 44 per cent, clothing 17.7, operating costs 12, rent 9.7, advancement 5.9, maintenance of health 4.7, life and health insurance 2.6, personal 1.2, and unclassified 0.2 per cent of the total for all families. Owner families, smaller in size, seemed to be equally well or better fed than tenant or cropper families, lived in better houses, and spent more money for other purposes. The percentage of all expenditures for clothing was lower for owners than for either tenants or croppers. As total expenditure increased, a larger proportion as well as more actual money was allotted to nonmaterial uses.

The percentage of all expenditures given to advancement is here taken as a significant index of the standard of living. A "cost-consumption unit" and a "household-size index" are used in the analysis of these data. The expenditure for goods consumed by the adult male for any group of goods being taken as unity or 1, expenditures for goods consumed by other members of the family

are weighted against it in terms of additional goods used. These scales, tested by the method of least squares, were found to be fairly satisfactory for clothing, furniture and furnishings, maintenance of health, advancement, and life and health insurance.

Net worth, or the total value of all unencumbered wealth of the farm family at the time of making the study, was accepted as the most adequate measure of the farmer's ability to pay. The average annual rate of accumulation was used also in certain of the analyses, as were the additional factors of the number of years since the farmer began his working life, acres per farm, cost of operation of the farm business, and the index of diversity of the farm business. The net worth of the farmer seemed to have the most significant bearing on the standard of living.

Both size of family and periods of growth in the family were found to be directly related to the standard of living. Schooling of parents showed less relation to the standard of living, in terms of expenditures, than ability to pay. The evidence is regarded as not sufficient to justify the conclusion that the standard of living is due primarily to economic advancement. Desires for a higher standard and the ability to pay must go hand in hand.

Some better things in farm life in Washington, F. R. YODER (*Washington Col. Sta. Bul. 195 (1925), pp. 5–45, figs. 14*).—Specific examples of rural community organization, community schools and churches, farm organizations, and boys' and girls' clubs in the State of Washington are described.

A census analysis of American villages, C. L. FRY (*New York: Inst. Social and Religious Research, 1925, pp. XVI+165, figs. 18*).—An analysis of the 1920 census data for 177 incorporated villages in the Middle Atlantic, Southern, Middle Western, and far Western sections of the United States is presented here. The villages selected were believed to be representative of agricultural villages in these sections.

Wide variations in their composition and characteristics are shown, particularly with reference to the ratio of colored to white and of foreign born to native born, the ratios between the sexes, the age distribution of the populations, and the marital status of the villagers. In the Middle Western villages only slightly more than 2 out of 3 males, 10 years of age and over, are gainfully employed, as compared with 3 out of 4 in the other regions. For the women this proportion varies from 17 per cent in the far West to 22 per cent in the South. The employment of children between 10 and 15 years of age is most common in the South, the rate for both boys and girls being more than twice that of any other region. Striking variations occur in the occupations of village inhabitants in the various regions. There are decided differences between village totals and those for the entire rural areas of the United States in the matter of the distribution of population as between rural and village totals.

Village populations, C. L. FRY (*Amer. Sociol. Soc. Pubs., 19 (1925), pp. 143–150, fig. 1*).—Some conclusions are offered and methods of obtaining the data are described in this paper, which was presented before the rural sociology section of the meeting of the American Sociological Society in 1924, the study being the same as is published in full in the above. It is brought out here that (1) the more rapidly the villages of an area are growing the more nearly normal is the age distribution of the population; (2) the friction which so often exists between village and open-country populations can partly be explained from the fact that such a relatively small proportion of villagers are engaged in agricultural occupations; (3) there is reason to believe that the differences between village and open-country populations are so great that in reality the term "rural" as used by the census would better be divided into

two distinct subcategories, the village and the open country; and (4) the census data lead to the hypothesis that certain sections of the country have been left with an oversupply of villages by the recent changes in methods of transportation which give people in the country easy and quick access to the larger centers.

The Icelandic community in North Dakota economic and social development period 1878–1925, T. JACKSON (*Social Forces, 4 (1925), No. 2, pp. 355–360, fig. 1*).—This is a sketch of the economic and social developments in an Icelandic agricultural community in Pembina County, N. Dak. It describes the unity of association and communal accomplishment of the early years, the changes that came about in community life and institutions, and the gradual establishment of relationships between the larger and smaller units that tended to modify the racial, social, and economic solidarity of the community.

The task of the rural church, I, II, C. C. TAYLOR (*Rural Amer., 3 (1925), Nos. 7, pp. 3, 4; 8, pp. 7, 10*).—The specific function of the rural church in furnishing continuous ethical and moral leadership in the community is set forth here in part 1 of an article on the rural church. It is held that the preacher must live in the community over a period of years and conduct systematic training in judgments and ideals and actively participate in guiding human adjustments. In part 2, under the title The Program of the Rural Church, certain principles upon which a rural church program should be projected are suggested, as that the church should reach every member of the community and each class of persons in it; it should do whatever needs to be done to uplift the community and should have such a program that, if taken away, it would be vitally missed by the community; it should consistently compensate the community in known values for all the contributions made to it; and should work consistently to enlist and direct all members of the community in Christian activity.

The little country theater, A. G. ARVOLD (*New York: Macmillan Co., 1922, pp. [8]+220, pls. 26*).—This volume aims principally to show how the latent dramatic talent in rural communities can be and has been developed in the writing and producing of plays best adapted to the particular situation and to the available facilities. Some of the plays and pageants that have been produced at North Dakota Agricultural College and taken on tour over the State are described.

[The statistical work of the National Government, with reference to agriculture], L. F. SCHMECKEBIER (In *The Statistical Work of the National Government. Baltimore, Md.: Johns Hopkins Press, 1925, pp. 177–233*).—This portion of one of the Studies in Administration published by the Institute for Government Research submits the results of an inquiry into what the National Government has done and is doing in the way of collecting and publishing information on general agricultural conditions, crop production, livestock, and livestock products.

Agricultural statistics [trans. title] (*Estatis. Agr. [Brazil], 1924, I, pp. 210, pls. 4*).—Tabulated statistics are presented by municipalities and States of Brazil and by months from January to June, inclusive, 1924.

Annual agricultural statistics, 1923 [trans. title] (*Statis. Agr. Ann. [France], 1923, pp. 272*).—Annual statistics of agricultural production in France continue the series previously noted (E. S. R., 52, p. 194).

Estimates of area and yield of principal crops in India, 1923–24, D. N. GHOSH (*India Dept. Com. Intel. and Statis., Est. Area and Yield Princ. Crops*

India, 1923–24, pp. [2]+47, pl. 1).—This volume continues the series previously noted (E. S. R., 52, p. 396).

Wheat and rye statistics (*U. S. Dept. Agr., Statis. Bul. 12 (1926), pp. 119*).—A statistical summary of the wheat and rye acreage, production, yields, prices, marketing, exports, imports, and other items for the year ended December 31, 1924, with comparable data for earlier years, is presented here, having been prepared under the direction of L. B. Flohr by H. S. Irwin, W. G. Hamilton, and J. L. Wilson. Data on wheat flour and certain milling by-products are included.

Statistics of the rice crop year 1924–1925 (*New Orleans, La.: Rice Millers' Assoc., 1925, pp. [8]*).—Statistics have been compiled covering the period from August 1, 1924, to July 31, 1925, showing the production, distribution, consumption, carry over, stocks, and domestic exports of rice, together with shipments to Porto Rico, Alaska, and Hawaii; rice consumption in Porto Rico; and imports and exports of foreign rice.

Statistical review of the wool and wool textile trades, 1912–1924 (*London: H. Dawson & Co., 1925, pp. XIX+87, pls. 4*).—A summary of trade conditions and statistics up to December 31, 1924, is given for the United Kingdom, Germany, and France. The detailed tabulated statistics of the wool and wool textiles trade are given for the United Kingdom, France, Germany, the United States, Australia, New Zealand, South Africa, and South America. Index numbers and graphic illustrations are included.

[Reviews of the imported dairy produce trade, 1922–1925], W. WEDDEL & Co., LTD. (*Weddel's Ann. Rev. Imported Dairy Prod. Trade, 28 (1922), pp. 11, pl. 1; 29 (1923), pp. 14, pl. 1; 30 (1924), pp. 14, pl. 1; 31 (1925), pp. 12, pl. 1*).—These are annual trade reports summarizing the imports into the United Kingdom of butter and cheese and describing the course of market prices. They continue the series previously noted (E. S. R., 46, p. 276).

AGRICULTURAL AND HOME ECONOMICS EDUCATION

The effectiveness of extension in reaching rural people, M. C. WILSON (*U. S. Dept. Agr. Bul. 1384 (1926), pp. 20, figs. 6*).—Some of the results of a field study of 3,954 farms in Iowa, New York, Colorado, and California made by the Office of Cooperative Extension Work and the extension services of the respective States in the summer and fall of 1923 and the spring and fall of 1924 are shown here.

The farm operator or members of his family had attended or taken part in some extension activity in the case of 60 per cent of the farms. Field demonstrations, meetings, or other extension activities relating either to the farm or the home were reported on 15 per cent. Boys and girls on 13 per cent were either enrolled in club work or had been at some previous time. Direct contact between representatives of the extension service and members of the farm family was reported by 69 per cent, contact with the county agent by 59, with the home demonstration agent by 33, and with the subject-matter specialist by 29 per cent of the farms.

Of the 2,912 farms reporting the adoption of better practices, 68 per cent reported the influence of propaganda methods, 27 per cent mentioned personal service, 58 per cent object-lesson methods, and 49 per cent indirect influences. The percentage reporting the influence of propaganda methods was highest in every State, with object-lesson methods second, and personal-service methods third.

Other factors, such as condition of land occupancy, size of farm, distance from the county extension office, membership in the extension association, and participation in extension activities, are discussed, and brief notes are included on boys' and girls' club work, the influence of subject-matter specialists, and the attitude of farmers toward extension work.

FOODS—HUMAN NUTRITION

The newer knowledge of nutrition, E. V. McCollum and N. Simmonds (*New York: Macmillan Co., 1925, 3. ed., rewritten, pp. X+675, figs. 49*).—In the revision of this volume (E. S. R., 47, p. 363) less attention has been paid to criticisms of some of the earlier nutrition work, particularly on protein requirements, and the space thus saved has been used to advantage in the expansion of other topics, notably rickets, the dietary habits of man in different parts of the world, with reasons for success or failure of nutrition of certain peoples, and the dietary properties of individual foodstuffs. Chapters have been added on the relation of the diet to resistance to disease, iodine deficiency and goiter, and bios and the growth of yeast. An extensive bibliography of the literature through 1924 is appended.

The chemical and physiological properties of the internal secretions, E. C. Dodds and F. Dickens (*London and New York: Humphrey Milford, Oxford Univ. Press, 1925, pp. XIV+214, figs. 3*).—This volume is essentially a summary of the literature dealing with the chemical aspects of the internal secretions of the pancreas (insulin), the pituitary body (tethelin, pituitrin, hypophysin), the thyroid (iodothyrin, iodothyreoglobulin, thyroxin), the ovaries, the suprarenals (adrenaline, adrenine, epinephrine), and the more obscure secretions secretin, parathyroid preparations, and spermine. References to the original literature are assembled as a bibliography at the end of each section.

The normal diet, W. D. Sansum (*St. Louis: C. V. Mosby Co., 1925, pp. 72, fig. 1*).—A simple and concise presentation of the fundamental principles of nutrition as given by the author to patients suffering from various nutritional disorders.

Feeding and the nutritional disorders in infancy and childhood, J. H. Hess (*Philadelphia: F. A. Davis Co., 1925, 4. ed., rev. and enl., pp. XVI+556, pl. 1, figs. 43*).—This is the fourth edition of this manual on infant feeding with special reference to nutritional disorders.

The chemistry of bread.—Some New Zealand wheat-flours and fermentation, W. L. M. Dearsley (*New Zeal. Jour. Sci. and Technol., 8 (1925), No. 1, pp. 34–38*).—A brief review of present theories concerning the physicochemical properties of flour and the optimum conditions for bread making is followed by the report of analyses of five New Zealand flours, with data on their breadmaking qualities and the correlation of these values with the points brought out in the theoretical discussion.

The order of acidities (calculated as lactic) of the different flours was practically that of their pH values. The degree of hydration of the gluten was proportional to the H-ion concentration. The water absorption values of the flours appeared to depend upon the quantity and quality of the gluten, and the latter upon the initial pH of the dough. The ideal flour is considered to be one possessing a high proportion of gluten and producing a dough of about pH 5. The baking data showed correlation with the dough fermentation tests in that the best results were obtained with the flour ranking first with respect to the initial pH of the dough and the quality of the gluten.

Home canning of fruits and vegetables, P. Jones (*Ala. Polytech. Inst. Ext. Circ. 85 (1925), pp. 31, figs. 6*).—A compilation of methods prepared particularly for the benefit of the club girls and women in Alabama.

Energy expenditure of women during horizontal walking at different speeds, H. M. Smith and D. B. Doolittle (*Jour. Biol. Chem., 65 (1925), No. 3, pp. 665–676, fig. 1*).—Data are reported on the energy expenditure of 9 young women subjects during horizontal walking for a distance of 326.8 meters (357.3 yds.) at speeds of 60 and 90 meters a minute and for half this distance at a speed of 30 meters a minute. Data were also obtained on the metabolism of the same subjects when standing quietly. The determinations were all made in the morning before eating.

In the standing experiments the average heat output per kilogram of body weight per hour was 1.07 calories and per square meter of body surface per hour 36.4 calories. The average heat expenditure for the three speeds of walking was 2.11, 3.01, and 4.39 calories per kilogram of body weight and 72.4, 103.3, and 150.1 calories per square meter of body surface per hour, respectively. Computing the increased energy expenditure for walking by deducting the standing requirements for the same day, average values were obtained of 0.528, 0.486, and 0.553 gram calories for speeds of 30, 60, and 90 meters per minute, respectively. It is of interest that the very slow rate of 30 meters required more energy than the moderate rate of 60 meters per minute. This was true for all but 2 of the 9 subjects, and in 3 of the subjects the expenditure was higher at 30 than at 90 meters.

A comparison of the data with data previously reported by the senior author for horizontal walking by men (E. S. R., 47, p. 562) showed sufficiently close correlation to indicate that the energy expenditure of women during walking is not appreciably different from that of men.

A comparison of the standing metabolism as measured by oxygen consumption of several of the subjects during the menstrual period with that of nonmenstrual days showed no difference which could be attributed to menstruation. In some cases there was a decrease and in others an increase in metabolism during the menstrual period, and in 2 subjects upon whom data were obtained on more than one day both increases and decreases were noted.

A cage device for the study of ketosis and nitrogen metabolism in small animals, H. Levine and A. H. Smith (*Jour. Lab. and Clin. Med., 11 (1925), No. 2, pp. 168–172, figs. 3*).—A special feature of the metabolism cage described and illustrated is the use of mineral oil in the funnel upon which the cage rests and into which the feces and urine drop through the wide mesh screen floor of the cage. The funnel is fitted tightly in a separatory funnel through which the urine can be drawn off. The urine is separated from the feces by a small screen near the stem of the funnel. The use of the mineral oil prevents the volatilization of the acetone bodies when the apparatus is used for metabolic studies of ketosis. The feeding device consists of a small food cup resting upon a rubber stopper in a larger beaker fastened at a convenient height above the floor of the cage. Drinking water is obtained from an inverted bottle fitted with a glass tube.

The chemistry of proteins and its relation to nutrition, D. B. Jones (*Amer. Jour. Pub. Health, 15 (1925), No. 11, pp. 953–957*).—A general discussion, based largely upon the extensive series of protein investigations by the author and coworkers at the Bureau of Chemistry, U. S. D. A. (E. S. R., 52, p. 802).

The influence of high protein diet on the kidneys, A. J. Miller (*Jour. Expt. Med., 42 (1925), No. 6, pp. 897–904*).—Seven groups of rats were fed for periods of from 9 weeks to 6 months on diets containing protein, varying in amount from 1.36 to 40.18 per cent and derived from grains, casein, meat,

and milk, together with the other essentials of a normal diet. From one animal in each group one kidney was removed to double the load on the remaining one. Blood uric acid and blood urea nitrogen determinations were made at the beginning and end of the experiment, and the kidneys were weighed and examined microscopically on autopsy.

The kidneys of the animals receiving the high protein diet showed hypertrophy, amounting in the case of the nephrectomised animals to an increase in weight of an average of 0.54 gm., or 85 per cent of the average weight of the right kidneys of the controls. The blood analyses and microscopic examinations of the kidneys showed no evidence of kidney damage. It is emphasised, however, that this should not lead to the conclusion that patients with nephritis *may eat any amount of protein.*

Acid- and base-forming elements in foods, G. W. CLARK (*Jour. Biol. Chem., 65 (1925), No. 3, pp. 597–600*).—Ash analyses expressed in milligrams per 100 gm. of the edible portion are reported for white and Graham bread, Graham crackers, Shredded Wheat, California polished rice, whole milk, California full cream cheese, canned roast beef, eggs, fresh green peas, fresh green string beans, peeled raw potatoes, canned California tomatoes (solid pack), California seeded raisins, dried apples, and dried Santa Clara prunes.

The influence of orally administered calcium salts on the serum calcium of normal and thyreoparathyroprivic dogs, A. M. HJORT (*Jour. Biol. Chem., 65 (1925), No. 3, pp. 783–795, figs. 4*).—The literature on the absorption of calcium from various calcium salts by human and animal subjects is reviewed, and data are reported on the relative absorption of calcium lactate, chloride, glycerophosphate, carbonate, and bicarbonate by normal dogs, together with data on the absorption of calcium lactate by three thyreoparathyroprivic dogs.

The relatively soluble calcium salts, such as lactate, chloride, and glycerophosphate, when administered orally in amounts containing an equivalent of 0.2727 gm. of CaO per kilogram of body weight were rapidly absorbed, increasing the serum calcium from 17.4 to 48.2 per cent in the case of the lactate, about 32 per cent in the case of the chloride, and from 8.26 to 9.8 per cent in the case of the glycerophosphate. In smaller amounts calcium lactate resembled the less solnble salts in giving inconstant increases in the blood calcium. The administration of calcium salts to the thyreoparathyroprivic dogs increased the calcium level and temporarily controlled tetany.

Researches on the comparative physiological importance of iron and zinc [trans. title], G. BERTRAND and H. NAKAMURA (*Bul. Soc. Chim. Biol., 7 (1925), No. 8, pp. 933–941, figs. 6*).—Previously noted from another source (E. S. R., 54, p. 193).

The absorption of copper during the digestion of vegetables artificially coloured with copper salts, J. C. DRUMMOND (*Analyst, 50 (1925), No. 595, pp. 481–485*).—Previously noted from another source (E. S. R., 52, p. 259).

Tissue changes following deprivation of fat-soluble A vitamin, S. B. WOLBACH and P. R. HOWE (*Jour. Expt. Med., 42 (1925), No. 6, pp. 753–777, pls. 4*).—Essentially noted from a preliminary report (E. S. R., 54, p. 294).

Studies on experimental xerophthalmia, T. OKAMOTO (*Japan Med. World, 5 (1925), No. 7, pp. 180–183*).—The author reports the development of xerophthalmia in young rabbits following an exclusive diet of bean curd dregs (the residue left after filtering through cloth ground beans boiled at 100° C. for 30 minutes). The eye symptoms and pathological findings reported are identical with those reported in the literature for animals of other species. The xerophthalmia was cured by the feeding of cod liver oil or fresh vegetables but not by exposure to sunlight or ultra-violet light.

A biochemical study of by-product yeast, J. S. Hepburn (*Jour. Franklin Inst., 200 (1925), No. 6, pp. 767–770, fig. 1*).—A limited amount of evidence is presented showing that dried by-product yeasts, including bottom yeast from an industrial alcohol plant, bottom yeast from a beer brewery, and a yeast from an ale brewery, contain vitamin B in appreciable amounts.

A study of heat production in pigeons on diets deficient in vitamin B, C. J. Farmer and H. E. Redenbaugh (*Amer. Jour. Physiol., 75 (1925), No. 1, pp. 27–44*).—Three diets—autoclaved grain and the Sugiura and Benedict butter and lard diets with yeast (E. S. R., 49, p. 160)—were used in this investigation of the changes in body temperature of young pigeons during the course of experimental polyneuritis. Controls were maintained on whole grains and on the above synthetic diets supplemented with yeast powder, and others were given water only. The time required to deplete the body of its vitamin content on each of the different diets, as determined by the onset of polyneuritis, was noted, together with the changes occurring in body weight, temperature, respiratory quotient, and heat production. The calorimetric determinations were made in small respiration chambers similar to that described by Benedict (E. S. R., 33, p. 265).

The symptoms of polyneuritis appeared first in the group on the synthetic lard diet, then in the one on the synthetic butter diet, and finally on the autoclaved grain. The second period of vitamin depletion following a curative dose of yeast concentrate was shorter than the first on each of the diets.

The average decrease in body temperature was 6° F. Following a curative dose of 0.5 gm. of yeast concentrate, there was a rapid rise in temperature, the normal being reached in about 18 hours if food was given along with the yeast. In the starving pigeons the temperature on the eleventh day was practically the same as that of the polyneuritic pigeons at the onset of convulsions, but rose much more rapidly, reaching normal in about 2 hours. The loss in body weight followed the same order as the depletion of body vitamin in the various groups.

A progressive lowering of the respiratory quotient accompanied the depletion of vitamin B, the lowest values being obtained at the onset of convulsions. The rise in respiratory quotient was rapid following the administration of 0.5 gm. of yeast extract and in 24 hours was approximately 1. In the starving animals there was an even greater reduction in the respiratory quotient, and the increase in response to food was rapid.

The average heat production of the control pigeons on adequate diets was 921, that of the polyneuritic pigeons at the onset of convulsions 633, and that of the starving pigeons on the eleventh day 430 calories per square meter per 24 hours. The response to food was rapid in all cases, the heat production returning to normal in about 24 hours.

The decrease in digestive efficiency in polyneuritis columbarum, C. J. Farmer and H. E. Redenbaugh (*Amer. Jour. Physiol., 75 (1925), No. 1, pp. 45–51*).—In this study of the possible influence of vitamin B on digestive enzymes, pigeons from the above study were used as subjects. From the pancreas and first 6 in. of the intestines of several which had died or were killed during polyneuritic convulsions and of some of the normal controls, glycerol extracts were prepared. The extracts from the pancreas and intestines were used in artificial digestion experiments with starch, ethyl butyrate, and casein as substrate.

Efficient digestion of all of these materials occurred with the extracts of normal pigeons. With those of the polyneuritic pigeons there was no digestion of starch or ethyl butyrate, and the amount of casein digested was about 60 per cent of the normal. The stomach extract of the normal pigeons brought

about coagulation of milk in an average of 9.85 minutes, while the corresponding time for that of the polyneuritic pigeons was 34 minutes.

It is concluded that in severe polyneuritis in pigeons amylolytic and lipolytic enzymes are not formed by the pancreas, or if secreted remain inactive, due *to the absence of an intestinal activator.* During recovery the effect of vitamin B is considered to be a restoration of the function of the digestive enzymes, as well as those of tissue oxidation.

The metabolism of phosphorus and calcium in young rats on a rachitic diet rich in calcium under the influence of ultra-violet light, cod-liver oil, and phosphates [trans. title], P. SCHULTZER (*Compt. Rend. Soc. Biol.* [*Paris*], *93* (*1925*), *No. 30, pp. 1005–1007*).—Young rats weighing from 40 to 50 gm. each were fed a low-phosphorus rickets-producing diet for 10 days, after which they were placed in separate metabolism cages for an experimental period of 20 days divided into five periods of 4 days each. Some of the animals were continued on the rachitic diet throughout the whole period, and others at the end of 8 days were given cod-liver oil, ultra-violet light treatment, or additional phosphorus in the form of phosphates. All three of these treatments sufficed to cure rickets, which developed in the preliminary period and continued in the controls.

From the calcium and phosphorus determinations of the feces and urine by microchemical methods, figures representing the retention in milligrams per gram gained in body weight were calculated. In the preliminary period the retention figures for phosphorus and calcium in the controls averaged 5.2 and 9.5 mg., respectively, and in the final period 4.7 and 8.2 mg. The average figures in the other three groups were practically the same in the preliminary period, but following the various treatments there was a marked increase in both phosphorus and calcium, the averages being 10 and 15.7 mg. for the group treated with ultra-violet light, 10.7 and 18.4 for the cod-liver oil group, and 10.6 and 18.6 mg. for the phosphate group.

A difference was noted in the effect of the first two methods of treatment as compared with the third. In the rachitic controls and in the animals treated with ultra-violet light and cod-liver oil from 20 to 30 per cent of the calcium excretion was by way of the urine and the remainder in the feces, but in the animals receiving additional phosphorus the amount of calcium excreted in the urine fell to about 5 or 6 per cent while that excreted in the feces increased slightly. This is thought to indicate that the retention of calcium during the phosphate treatment is not due to a more abundant resorption through the intestines, but depends upon a more pronounced retention of a certain quantity of the absorbed salts.

The calcium and inorganic phosphorus of the serum of rachitic rats under the influence of different treatments [trans. title], P. SCHULTZER (*Compt. Rend. Soc. Biol.* [*Paris*], *93* (*1925*), *No. 30, pp. 1008–1010*).—This study supplements the above by data on the blood calcium and inorganic phosphorus of young rats on a rachitic diet supplemented by treatment with ultra-violet light, cod-liver oil, or phosphorus.

As in the metabolism studies, a difference was noted in the effect produced by the first two treatments as compared with the third. Following treatment with cod-liver oil or ultra-violet light, the blood phosphorus was brought up to normal levels of about 10 mg. per 100 cc., and the calcium was raised about 25 per cent above normal to about 15 mg. per 100 cc. On increasing the phosphorus or decreasing the calcium of the diet rickets was prevented, and the blood calcium and phosphorus were brought to normal levels, but there was no increase in calcium above the normal. Treatment with irradiated oils pro-

duced the same effect as cod-liver oil or ultra-violet light, but the phosphorized oil was without effect on the serum calcium or rickets.

The action of insulin on experimental beriberi in the pigeon [trans. title], X. Chahovitch (*Compt. Rend. Soc. Biol.* [*Paris*], *93* (*1925*), *No. 34*, *pp. 1333–1335*).—A brief report is given of a study of the effect of insulin upon the symptoms of polyneuritis or beriberi experimentally produced in pigeons by a diet of polished rice. The insulin was injected subcutaneously in doses of from ¼ to ½ of a unit either before or after the development of polyneuritic symptoms.

In pigeons showing slight symptoms of polyneuritis, the injection of insulin caused a temporary disappearance of these symptoms and prolonged life. In others receiving insulin before the development of symptoms, the characteristic lowering of the body temperature was delayed. The loss in weight was more gradual in the insulin-treated pigeons than in those not treated.

Intarvin in diabetes, M. Kahn (*Arch. Int. Med.*, *36* (*1925*), *No. 1*, *pp. 44–50*).—Evidence from the literature on the favorable effects of intarvin in the diabetic diet is summarized and discussed. Contrary to the experience of many, the author states that intarvin is quite palatable, does not cause nausea, and appears to satisfy the craving of the diabetic patient for fat. "If the physician does not impress the patient with a psychologic distaste, the patient will not observe any disagreeable flavor or odor. It surely is more tasteful than any emulsion of cod-liver oil."

Inulin and artichokes in the treatment of diabetes, H. F. Root and M. L. Baker (*Arch. Int. Med.*, *36* (*1925*), *No. 1*, *pp. 126–145*).—The usefulness of Jerusalem artichokes, inulin, and levulose in the diabetic diet has been studied by adding these foods to the diet, by substituting them for other carbohydrates, and by replacing inulin with artichokes and observing subsequent changes in the respiratory quotient and heat production as evidence of the absorption and utilization of the carbohydrate ingested. Varying amounts of these foods were also given patients in the post-absorptive stage and observations made of the changes in the respiratory metabolism, blood, and urine during the following six hours.

It was demonstrated clinically that Jerusalem artichokes could be added to the diabetic diets in moderate amounts, averaging 130 gm. daily of the uncooked vegetable, without increasing glycosuria or producing it when absent. In certain cases the substitution of artichokes for other carbohydrates rendered the urine sugar-free without an increase in the insulin or decrease in the diet. It was even possible to increase somewhat the total calories of the diet with only a slight addition to the insulin dosage. The metabolism experiments showed an increase in the respiratory quotient with artichokes occurring later and continuing for a longer time than with corresponding amounts of levulose. The artichokes also produced a definite increase in blood sugar, which was less, however, than that produced by levulose. Inulin from dahlia tubers had a slight but definite effect on the respiratory quotient, but caused no change in the blood sugar percentage.

It is suggested that the beneficial effects of the artichokes are due to slow absorption of the levulose liberated. Baking is recommended as the best method of cooking to render them the most palatable without loss of inulin.

The effect of ultra-violet radiation upon experimental tetany, W. W. Swingle and J. G. Rhinhold (*Amer. Jour. Physiol.*, *75* (*1925*), *No. 1*, *pp. 59–69*).—Evidence of the favorable action of ultra-violet light on calcium assimilation is afforded by this study of ultra-violet radiations on normal and parathyroidectomized dogs.

The exposure of normal dogs to radiations from a quartz mercury vapor lamp at a distance of 40 cm. for 1 hour daily for periods ranging from 4 to 12 days did not alter appreciably the level of serum calcium nor delay the development of tetany following parathyroid removal, but did prolong the life of the animals and ameliorate the symptoms in such animals. "The amelioration of tetany symptoms by ultra-violet rays and prolongation of life of parathyroidectomized dogs is probably due to the effect of such radiation in increasing the absorption and retention of the small amounts of calcium obtained from the food, so that its elimination from the blood and tissues is less rapid than in nonradiated parathyroidectomized dogs."

TEXTILES AND CLOTHING

The dependence of the moisture content of textile fibers on the prevailing humidity [trans. title], J. OBERMILLER and M. GOERTZ (*Melliand Textilber., 7 (1926), No. 1, pp. 71–76, fig. 1*).—Studies on cotton, wool, silk, and rayon showed that the hygroscopicity of the fibers progressively declines under the influence of air, especially under high temperatures. The absorption of moisture by the fresh fiber always appeared to be somewhat more rapid than in fibers previously dried by heating.

The importance of controlling relative humidity in textile operations [trans. title], J. OBERMILLER (*Ztschr. Angew. Chem., 38 (1925), No. 37, pp. 838, 839*).—The relation between the moisture content of fibers and the humidity of the air was studied at different degrees of humidity with a constant temperature of 20° C. The data indicated that in absolutely dry air the fibers lose all trace of moisture even at ordinary temperatures. In moist air, however, wool, silk, cuprammonium or viscose rayon and cotton appear to take up more than 32, 35, 40, and 26 per cent, respectively, of moisture based on the dry weight of the fiber. Numerous measurements on single fibers showed the relative wet strength for cotton to be from 110 to 120 per cent, cellulose acetate rayon from 65 to 70 per cent, cuprammonium rayon from 50 to 60 per cent, viscose rayon from 45 to 55 per cent, and nitrocellulose rayon from 30 to 40 per cent.

The reflection of light from textile materials and the physical causes of their lustre, G. A. R. FOSTER (*Brit. Cotton Indus. Research Assoc., Shirley Inst. Mem., 5 (1926), No. 1, pp. 5*).—The observed variation of the intensity of the light reflected from raw cottons with the geometrical shape of the fibers may be accounted for by single surface reflections. The luster of textile fibers depends upon the luster of their surfaces and upon their shapes. The fibers of maximum luster are cylindrical, and the luster decreases with departure from cylindrical form. In a discussion of factors determining the luster of raw cotton it is indicated that the luster of the finished product can not exceed that of raw material in the form of a pad of parallel fibers, and maximum luster is only had when the fibers are laid straight and parallel. Luster of single yarns thus decreases with increase in the twist.

The influence of the raw material on the strength characters of jute yarn [trans. title], H. RUDOLPH (*Melliand Textilber., 7 (1926), No. 1, pp. 76–79, figs. 4*).—The raw material may have extensive effects on the strength of the yarn spun therefrom. Yarn spun from different sorts of raw jute unmixed showed variations in the breaking lengths of the same yarn twist. The mixing of several brands of raw jute was expressed by proportionally large variations in the strength of yarn. Seasonal condition also affected yarn strength, that from pure stock as well as from mixtures.

The critical degree of twist in these experiments was determined to lie between α=0.85 and 0.9. The breaking extension amounted to from 1.8 to 2 per

cent in the vicinity of the critical degree of twist and increased with the degree of twist. While the highest breaking extension coincided with the maximum breaking length in cotton and wool yarns, this did not hold for jute. The extension rose further with the degree of twist.

Wool: The raw materials of the woolen and worsted industries, S. H. Hart, edited and rev. by E. W. France (*Philadelphia: Philadelphia Textile School, 1924, 2. ed., rev., pp. XXI+249, pl. 1, figs.* [91]).—This is a revised and enlarged edition of the work noted earlier (E. S. R., 37, p. 894).

A biometrical analysis of merino wool fibres, J. E. Duerden and V. Bosman (*So. African Jour. Sci., 22 (1925), pp. 248–262, figs. 4*).—Measurements showed that single wool fibers vary considerably in thickness at different places along their length. In proportion to thickness fine fibers vary more than coarse, but the latter deviate more from the average thickness than do fine fibers. Such variations seem due to changes in the physiological condition of the sheep during the year's growth of fleece.

The thickness of the individual fibers in a single staple of merino wool varied greatly, but less in fine wools than in coarse. Measurement of 500 fibers from each of 3 samples showed 10 different thicknesses in the fine wool, 14 in the medium wool, and 19 in the coarse wool, the interval between the measurements being 1.8μ. The differences among the fibers are less in a staple of fine wool than in one of coarse wool. Fine wool ranged from 9 to 25.2μ, medium wool from 9 to 32.4μ, and coarse wool from 12.6 to 45μ. The range between the extremes in fine wool was found to be 16.2μ, in medium wool 23.4μ, and in coarse wool 32.4μ—differences of 180, 260, and 265 per cent, respectively. No sample of wool is made up wholly of fine fibers or medium or coarse but is a mixture of a large number of each. However, finer fibers and more of them occur in fine wools and coarser fibers and more of them in coarse wools.

A method for making a complete analysis of all the fibers in a wool sample is outlined.

The specific gravity of wool and its relation to swelling and sorption in water and other liquids, A. T. King (*Jour. Textile Inst., 17 (1926), No. 1, pp. T53–T67, figs. 2*).—This paper deals with the significance of specific gravity determinations in relation to other properties of wool fiber and its use in investigating the effect on the wool fiber of reagents met with during manufacture. Penetration of the fiber by solvents and oils and density methods of determining regain and of estimating wool-cotton mixtures are also considered.

The sorptive effect is least with benzene, toluene, nitrobenzene, olive oil, and oleic acid, and the results obtained for dry wool in these liquids agree well. The benzene value, 1.3 (water=1), is taken as the true specific gravity. While no appreciable variation was found in samples of medulla-free wool, whether merino or crossbred, lower values were had as the tendency toward kempy nature increased. With other liquids, especially alcohols, only an apparent density is obtained. This exceeds the above value by an amount depending on the contraction in total volume resulting as a consequence of sorption of the liquid by the wool. The relation between density, swelling, and soaking regain can be expressed mathematically, and the swelling in water so calculated is about the same as that shown by direct measurement. Common salt reduces the swelling and regain caused by water alone and lowers the compression factor. When the regain is lowered by ordinary dehydration the compression factor is increased.

A comparison of measurements of diameters of wool fibres with the micro-balance and the projecting microscope, with applications to the determination of density and medulla (kemp) composition, S. G. Barker

and A. T. King (*Jour. Textile Inst.*, *17* (*1926*), *No. 1*, *pp. T68–T74*, *fig. 1*).—Results obtained by the two methods described agreed well for nonmedullated wools. The gravimetric method seemed convenient for ascertaining fiber diameter and afforded evidence of the reliability of the regain and specific gravity values given previously, namely, 1.3 for the specific gravity of grease-free dry wool.

With medullated or kempy fiber the diameter exceeds the observed diameter, the difference increasing with the proportion of medulla present. This discrepancy is significant, determining the proportion of air space in the medulla itself and in medullated fibers as a whole. The medulla contains about 90 per cent air space. In deriving relations between diameter of fiber and count of yarn with coarse, kempy wools, the light weight of a kempy fiber in comparison with its diameter must be allowed for. Calculating the cross section area from each reading of diameters separately and averaging the values was more accurate than a calculation derived from the average diameter.

The effect of various dips on wool (*Union So. Africa Dept. Agr. Jour.*, *12* (*1926*), *No. 3*, *pp. 249–260*).—Experiments in cooperation with Bradfield Technical College and the textile department of Leeds University were concerned with the effects of lime and sulfur, caustic soda and sulfur, and proprietary dips used for scab treatment on the spinning and dyeing qualities of wools treated therewith.

All dips seemed to have a somewhat prejudicial effect on wool. Lime and sulfur and the caustic and sulfur dips may render the wool more difficult for scouring but appear to offer no insuperable difficulties. In the subsequent processes the lime and sulfur and caustic and sulfur dipped wools showed up favorably. Dipping apparently had no detrimental effect on the dyeing and finishing properties of wool. The sooner the sheep are dipped after shearing the less the dip is liable to affect the wool.

Artificial silk (*U. S. Tariff Comn., Tariff Inform. Surveys [Pub.] L–4* (*1925*), *pp. VII+103*).—Descriptions, nomenclature, uses, properties and characteristics, production and preparation methods, domestic and foreign production and commercial movement, and the tariff status are presented for artificial silk, artificial horsehair, artificial silk waste, partially manufactured waste, spun artificial silk yarns, visca, and cellophane.

HOME MANAGEMENT AND EQUIPMENT

Value of bituminous coal and coke for generating steam in a low-pressure cast-iron boiler, C. E. Augustine, J. Neil, and W. M. Myler, jr. (*U. S. Dept. Com., Bur. Mines, Tech. Paper 367* (*1925*), *pp. IV+45*, *pl. 1*, *figs. 19*).—Tests made at various rates of steaming with Pittsburgh lump coal, Lower Kittanning coal, and by-product coke in a hand-fired low pressure cast-iron boiler for building heating are reported.

The calorific value of the Pittsburgh high volatile lump coal ranged from 13,150 to 13,750 B. t. u. per pound, that of the coke from 11,720 to 11,890, and that of the lower Kittanning medium volatile coal from 12,970 to 13,570 B. t. u. The bituminous coals contained less ash than the coke, about the same amount of moisture, and much more volatile matter. The medium volatile coal was of smaller size than the coke or the high volatile coal, and it packed when fired, causing greater resistance to the flow of air through the fuel bed. It also required more frequent slicing and breaking up of the fuel bed to maintain the desired rate of burning. The fuels with the higher ash content required the removal of more refuse from the grate. The percentage of clinker was highest with coke.

At low ratings the bituminous coals and coke were of about equal steaming value. At medium and higher ratings the coals evaporated more water than the coke. When coke was burned at a low rating the overall efficiency was about 76 per cent, but at the higher ratings this efficiency was less than that of the bituminous coals, being about 66 per cent.

The thermal efficiencies ranged from 65 to 74 per cent for the high volatile coal, and varied considerably at the high ratings. The thermal efficiencies for the medium volatile coal ranged from 66 to 72 per cent.

It was found that, other factors being unchanged, the nearer to the fuel bed the secondary air is supplied and the more thoroughly it is mixed with the rising combustible gases, the sooner the combustion will be completed and the larger will be the proportion of heat absorbed by the heating surfaces from the products of combustion. The pressure drop of air through the fuel bed was about the same for coke and high volatile coal, and was about half of that required for equal ratings with the medium volatile coal.

The medium volatile coal was slower to ignite and burn than the high volatile coal, and showed a tendency to form dead spots and air holes in the fuel bed. It burned unevenly and required much more attention than either of the other fuels.

Influence of moisture on the spontaneous heating of coal, J. D. Davis and J. F. Byrne (*Indus. and Engin. Chem., 18 (1926), No. 3, pp. 233–236, figs. 5*).—Studies conducted at the Pittsburgh Experiment Station of the U. S. Bureau of Mines are reported.

The results showed that Pittsburgh and Sharon coals as received will not heat in dry oxygen, but that the temperature drops instead owing to moisture vaporization. When treated with oxygen saturated at room temperature such coal will heat or cool, depending upon the rate of circulation of oxygen and the resultant rate of moisture vaporization. Bituminous coal dried in an inert atmosphere or in vacuum will invariably heat spontaneously from 70° C., provided the temperature of drying has not exceeded 140° or the time of drying has not been excessive.

The results are taken to indicate that since prolonged drying to as high a temperature as 140° is not likely to occur in storage, reversal of colloidal state is not an important factor in diminishing heating rates in storage. Under laboratory conditions a coal that has been moderately dried heats somewhat faster than a moist coal. It is therefore considered better to store the coal moist than dry, since the pores in the coal which are filled with moisture have no space for the adsorption of oxygen. Furthermore, if the coal is moist enough to be out of equilibrium with the atmosphere, moisture will slowly evaporate and there will be cooling due to latent heat of vaporization. A very dry coal, on the other hand, will take up moisture from the atmosphere and the heat of condensation will raise its temperature.

Generation of explosive gases in electric water heaters and boilers, J. W. Shipley and A. Blackie (*Engin. Jour [Canada], 9 (1926), No. 2, pp. 55–59, fig 1*).—Studies conducted at the University of Manitoba are reported which showed that gases of an explosive nature are generated in water heaters operating on bare submerged electrodes using 220- or 110-volt, 60-cycle alternating current. The nature of the gases depends upon the material of the electrodes. Carbon electrodes give hydrogen, oxygen, carbon monoxide, carbon dioxide, and hydrocarbon gases. Aluminum electrodes generate hydrogen and oxygen most vigorously, the oxygen being largely fixed as hydrated oxide of aluminum. Iron electrodes produce hydrogen and oxygen, with possibly a little carbon dioxide. The oxygen is largely fixed in the electrode chamber as hydrated oxide of iron.

The gases accumulating in the system are due to degassing of the water, the action of the water on iron producing hydrogen, and the generation of gases by the electrolysis of the water by alternating current. Frequent surging of the water from the expansion tank into the electrode chamber brings in dissolved atmospheric gases. Nitrogen and carbon dioxide dilute the explosive gases, but oxygen enhances the possibility of an explosion.

The rate of generation with fixed electrodes is largely a function of the electric current flowing and the temperature. Apparently a larger volume of hydrogen is generated near the boiling point than the temperature coefficient of the conductivity of the electrolyte will account for. Gases may be generated by the electric current in other parts of the system outside the electrode chamber. This is due to the intimate contact of the electrolyte with the whole metallic system and to the practice of electrically grounding the shell.

Steam reduces the explosiveness in so far as it dilutes the gases. The range of explosibility of hydrogen and oxygen mixtures is too great, however, to always permit the prevention of an explosion by the presence of steam in the gases generated. Gases generated by the 220-volt, 60-cycle current using iron electrodes in a water heater were found to explode in the presence of steam when fired by an electric spark.

The danger of ignition of the gases generated was found to be greater with heaters provided with electrodes entering from the top. Whenever the electrolyte is depressed so that one of the electrodes is completely bared, an arc will be produced. Other conditions may also arise within the electrode chamber causing the production of a spark sufficient to ignite the gases generated.

It is concluded that the explosive nature of the gases generated in this type of domestic water heater makes reliance upon automatic venting extremely hazardous. Since the generation of gases is a function of the alternating current electrolysis of water, all types of heaters in which the passage of the electric current through the water within the heater is possible can only be operated in the expectancy of having explosive gases generated.

Electric boilers operating on alternating current with bare submerged electrodes were found to generate equivalent quantities of hydrogen and oxygen, and these are carried out of the electrode chamber with the steam, accumulating wherever the steam is condensed. If raw water is used in the boiler, these explosive gases will be diluted with the gases of the atmosphere dissolved in the feed water. If condensate is used, the accumulation will more nearly approximate a mixture of hydrogen and oxygen of the maximum explosibility. Explosive mixtures of hydrogen and oxygen were found in air-locked radiators and escaping from the air valves of radiators provided with steam generated by an electric boiler operating on 2,200-volt, 60-cycle alternating current.

It is concluded that an explosion hazard exists in those parts of a system provided with steam from electric boilers wherever there is a possibility of gases accumulating from the condensate.

MISCELLANEOUS

Thirty-fifth Annual Report [of Washington College Station], 1925, E. C. Johnson et al. (*Washington Col. Sta. Bul. 196 (1925), pp. 79, figs. 4*).—This contains the organization list, a report on the work of the station, and a financial statement for the fiscal year ended June 30, 1925. The experimental work reported is for the most part abstracted elsewhere in this issue.

NOTES

Massachusetts College and Station.—Acting President E. M. Lewis has been appointed president. Willard A. Munson, for several years connected with the State Department of Agriculture, has been appointed director of extension. Dr. P. E. Bransfield, specialist in poultry disease elimination, has resigned, effective June 30.

Under an appropriation of $6,000 made by the last legislature, a dwelling house for the plant foreman is being built on the station poultry range.

In the early morning of May 31 the screen house, laboratory, and offices of the Cranberry Substation were burned to the ground, with the loss of all equipment, including both that used in handling the bog and that for scientific investigations.

Montana College and Station.—Dr. W. C. Cook, assistant entomologist, has been granted leave of absence for one year to take up work at the Minnesota University and Station. C. B. Philip has been appointed as a temporary assistant during this period.

W. B. Mabee, extension entomologist at the North Carolina College, has been appointed station and extension entomologist, dividing his time equally between the two activities and beginning work June 1. John P. Lewis has been appointed assistant in the grain laboratory.

Nebraska Station.—Dr. J. F. Olney has been appointed research assistant in animal pathology and hygiene and Irwin L. Hathaway research assistant in dairy husbandry.

Rutgers University.—The resignations are noted of R. R. Hannas, poultry research specialist; H. B. Sprague, assistant agronomist; M. Ethel Jones, specialist in girls' club work; Helen G. Bishop, assistant specialist in clothing; and J. W. Bellis, farm manager. H. O. Yates, D. Sc., has been appointed instructor in floriculture.

West Virginia University and Station.—Dr. H. G. Knight, director of the station, has also been appointed dean of the College of Agriculture to succeed the late Dr. George R. Lyman. Dr. R. B. Dustman has been appointed associate professor of agricultural chemistry and associate chemist in the station.

Wisconsin University and Station.—The new men's dormitories are being constructed on land now occupied by the college orchards. A new orchard is being established on a nearby farm, where 12 acres will be available. This tract will be divided into sections for instruction, research, and the trial of new varieties. The work with small fruits will also be relocated, and a similar arrangement of ground will be made.

Arrangements have been made with the U. S. D. A. Bureau of Biological Survey for cooperative work on rodent control in Wisconsin. Demonstrations for the control of rats, gophers, and other rodents were carried on in Jefferson County from May 31 to June 5 and in Rock County from June 7 to 12. G. C. Oderkirk is the field specialist in charge of this work.

W. A. Hartman and E. W. Allin have been added to the station staff in agricultural economics, the former for research on taxation of forest lands in Wisconsin and the latter for other tax research studies

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